Local Government Energy Audit Report

Ancora Psych Hospital - Boiler House March 31, 2025

Prepared for:
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Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities and help prioritize specific measures for implementation. Most energy conservation measures have received preliminary analysis of feasibility that identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to establish a basis for further discussion and to help prioritize energy measures.

TRC reviewed the energy conservation measures and estimates of energy savings for technical accuracy. Actual, achieved energy savings depend on behavioral factors and other uncontrollable variables and, therefore, estimates of final energy savings are not guaranteed. TRC and the New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

TRC bases estimated material and labor costs primarily on RS Means cost manuals as well as on our experience at similar facilities. This approach is based on standard cost estimating manuals and is vendor neutral. Cost estimates include material and labor pricing associated with one for one equipment replacements. Cost estimates do not include demolition or removal of hazardous waste. The actual implementation costs for energy savings projects are anticipated to be significantly higher based on the specific conditions at your site(s). We strongly recommend that you work with your design engineer or contractor to develop actual project costs for your specific scope of work for the installation of high efficiency equipment. We encourage you to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on selected products and installers. TRC and NJBPU do not guarantee cost estimates and shall in no event be held liable should actual installed costs vary from these material and labor estimates.

Incentive values provided in this report are estimated based on previously run state efficiency programs. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. Please review all available utility program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state, and federal requirements.

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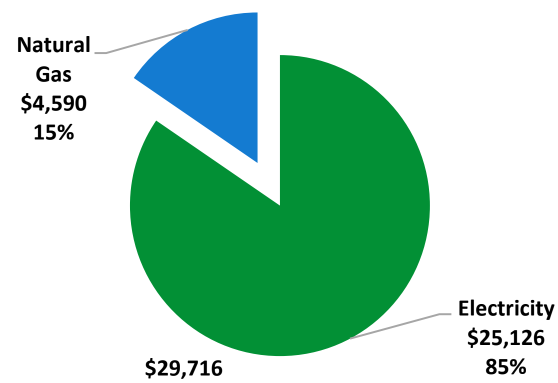
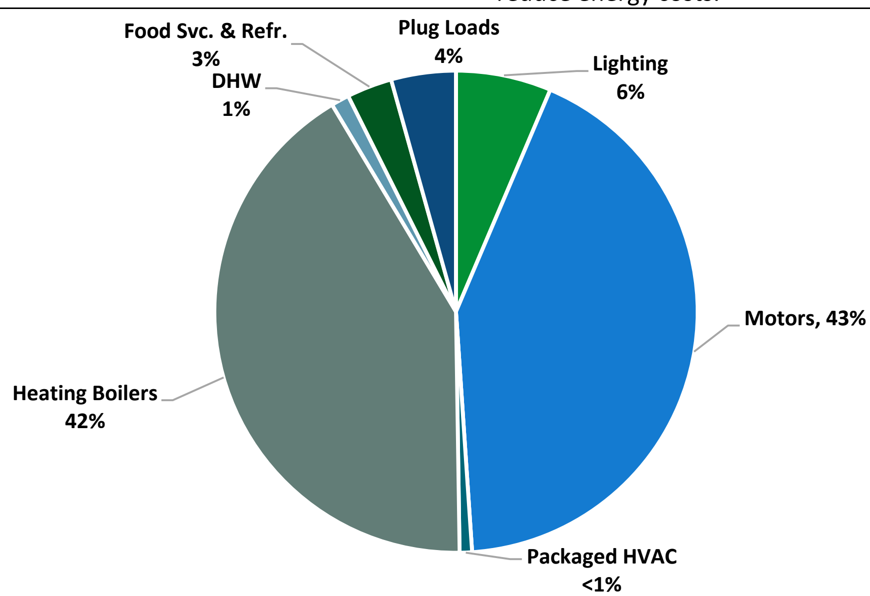
1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Ancora Psych Hospital (DMHH) - Boiler House. This report provides you with information about your facility's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in your facility. TRC conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and to help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Energy Utilities	Costs: $29,716 Electricity: 167,744 kWh Natural Gas[1]: 4,100 Therms	
ENERGY STAR® Benchmarking Score	N/A *(1-100 scale)*	A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.



Energy Use by System

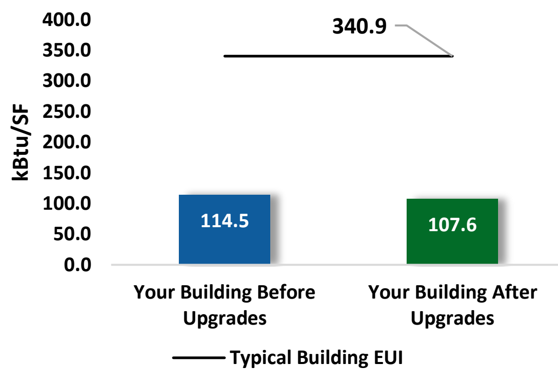
[1] Usage indicated refers to estimated total gas use for conditioning this building, not the gas usage for the boiler.

POTENTIAL IMPROVEMENTS

This energy audit considered a range of potential energy improvements in your building. Costs and savings will vary between improvements. Presented below are two potential scopes of work for your consideration.

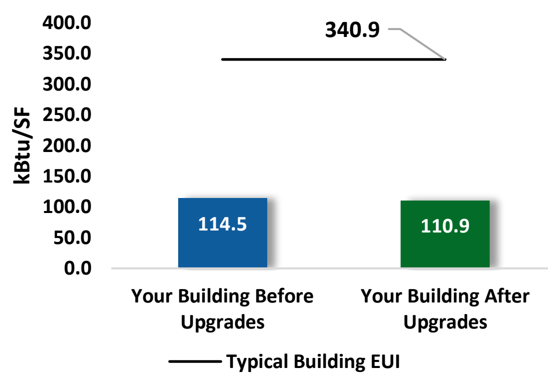
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$18,200
Potential Rebates & Incentives[2]	$2,300
Annual Cost Savings	$2,644
Annual Energy Savings	Electricity: 17,778 kWh Natural Gas: -17 Therms
Greenhouse Gas Emission Savings	9 Tons
Simple Payback	6.0 Years
Site Energy Savings (All Utilities)	6%



Scenario 2: Cost Effective Package[3]

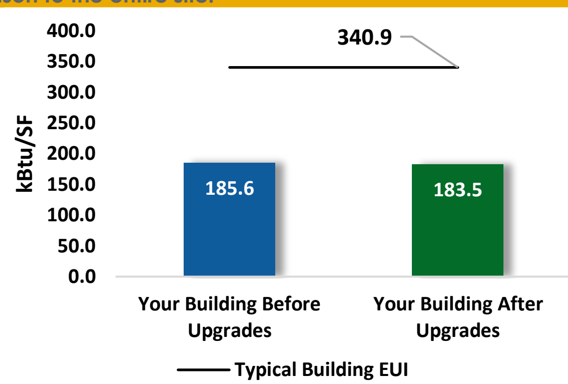
Installation Cost	$4,000
Potential Rebates & Incentives	$500
Annual Cost Savings	$1,401
Annual Energy Savings	Electricity: 9,482 kWh Natural Gas: -17 Therms
Greenhouse Gas Emission Savings	5 Tons
Simple Payback	2.5 Years
Site Energy Savings (all utilities)	3%



Scenario 3: Full Package (Boiler Replacement Measures)

*EUI is based on the natural gas used by the boiler in comparison to the entire site.

Installation Cost	$2,947,500
Potential Rebates & Incentives	$0
Annual Cost Savings	$19,612
Annual Energy Savings	Natural Gas: 17,523 Therms
Greenhouse Gas Emission Savings	103 Tons
Simple Payback	150.3 Years
Site Energy Savings (All Utilities)	1%



On-site Generation Potential

Photovoltaic	None
Combined Heat and Power	High

[2] Incentives are based on previously run state rebate programs. Contact your utility provider for current program incentives that may apply.

[3] A cost-effective measure is defined as one where the simple payback does not exceed two-thirds of the expected proposed equipment useful life. Simple payback is based on the net measure cost after potential incentives.

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**5,547**	**0.4**	**-1**	**$820**	**$2,120**	**$250**	**$1,870**	**2.3**	**5,471**
ECM 1	Install LED Fixtures	Yes	1,288	0.0	0	$193	$1,320	$100	$1,220	6.3	1,297
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	515	0.0	0	$76	$90	$10	$80	1.1	505
ECM 3	Retrofit Fixtures with LED Lamps	Yes	3,744	0.3	-1	$551	$710	$140	$570	1.0	3,669
Lighting Control Measures			**3,283**	**0.3**	**-1**	**$483**	**$1,650**	**$200**	**$1,450**	**3.0**	**3,218**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	3,283	0.3	-1	$483	$1,650	$200	$1,450	3.0	3,218
Variable Frequency Drive (VFD) Measures			**6,214**	**1.0**	**0**	**$931**	**$11,700**	**$1,800**	**$9,900**	**10.6**	**6,258**
ECM 5	Install VFDs on Condensate Pumps	No	6,214	1.0	0	$931	$11,700	$1,800	$9,900	10.6	6,258
HVAC System Improvements			**347**	**0.0**	**0**	**$52**	**$110**	**$20**	**$90**	**1.7**	**349**
ECM 6	Install Pipe Insulation	Yes	347	0.0	0	$52	$110	$20	$90	1.7	349
Domestic Water Heating Upgrade			**305**	**0.0**	**0**	**$46**	**$120**	**$30**	**$90**	**2.0**	**307**
ECM 7	Install Low-Flow DHW Devices	Yes	305	0.0	0	$46	$120	$30	$90	2.0	307
Custom Measures			**2,082**	**0.0**	**0**	**$312**	**$2,500**	**$0**	**$2,500**	**8.0**	**2,097**
ECM 8	Replace Electric Water Heater with Heat Pump Water Heater	No	2,082	0.0	0	$312	$2,500	$0	$2,500	8.0	2,097
TOTALS (COST EFFECTIVE MEASURES)			**9,482**	**0.6**	**-2**	**$1,401**	**$4,000**	**$500**	**$3,500**	**2.5**	**9,345**
TOTALS (ALL MEASURES)			**17,778**	**1.6**	**-2**	**$2,644**	**$18,200**	**$2,300**	**$15,900**	**6.0**	**17,700**

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

All Evaluated Energy Improvements for Boiler House[4]

[4] TRC bases estimated material and labor costs primarily on RS Means cost manuals as well as on our experience at similar facilities. This approach is based on standard cost estimating manuals and is vendor neutral. Cost estimates include material and labor pricing associated with one for one equipment replacements. Cost estimates do not include demolition or removal of hazardous waste. The actual implementation costs for energy savings projects are anticipated to be significantly higher based on the specific conditions at your site(s). We strongly recommend that you work with your design engineer or contractor to develop actual project costs for your specific scope of work for the installation of high efficiency equipment. We encourage you to obtain multiple estimates when considering measure installations.

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**1,752**	**$19,612**	**$2,947,500**	**$0**	**$2,947,500**	**150.3**	**205,171**
ECM 9	Install High Efficiency Steam Boilers	No	0	0.0	1,752	$19,612	$2,947,500	$0	$2,947,500	150.3	205,171
TOTALS (COST EFFECTIVE MEASURES)			**0**	**0.0**	**0**	**$0**	**$0**	**$0**	**$0**	**0.0**	**0**
TOTALS (ALL MEASURES)			**0**	**0.0**	**1,752**	**$19,612**	**$2,947,500**	**$0**	**$2,947,500**	**150.3**	**205,171**

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Boiler Replacement Energy Improvements

For more detail on each evaluated energy improvement and a break out of cost-effective improvements, see **Section 4: Energy Conservation Measures.**

1.1 Planning Your Project

Careful planning makes for a successful energy project. When considering this scope of work, you will have some decision to make, such as:

- How will the project be funded/and or financed?
- Is it best to pursue individual ECMs, groups of ECMs, or use a comprehensive approach where all ECMs are installed together?
- Are there other facility improvements that should happen at the same time?

Pick Your Installation Approach

Utility-run energy efficiency programs and New Jersey's Clean Energy Programs, give you the flexibility to do a little or a lot. Rebates, incentives, and financing are available to help reduce both your installation costs and your energy bills. If you are planning to take advantage of these programs, make sure to review incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives *before* purchasing materials or starting installation.

Options from Your Utility Company

Prescriptive and Custom Rebates

For facilities wishing to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the Prescriptive and Custom Rebates program. To participate, you can use internal resources or an outside firm or contractor to perform the final design of the ECM(s) and install the equipment. Program pre-approval may be required for some incentives. Contact your utility company for more details prior to project installation.

Direct Install

The Direct Install program provides turnkey installation of multiple measures through an authorized contractor. This program can provide incentives up to 70% or 80% of the cost of selected measures. A Direct Install contractor will assess and verify individual measure eligibility and perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

Engineered Solutions

The Engineered Solutions program provides tailored energy-efficiency assistance and turnkey engineering services to municipalities, universities, schools, hospitals, and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. The program provides all professional services from audit, design, construction administration, to commissioning and measurement and verification for custom whole-building energy-efficiency projects. Engineered Solutions allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs.

For more details on these programs please contact your utility provider.

Options from New Jersey's Clean Energy Program

Financing and Planning Support with the Energy Savings Improvement Program (ESIP)

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the ESIP. Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as attractive financing for implementing ECMs. You have already taken the first step as an LGEA customer, because this report is *required to participate in ESIP.*

Resiliency with Return on Investment through Combined Heat and Power (CHP)

The CHP program provides incentives for combined heat and power (i.e., cogeneration) and waste heat to power projects. Combined heat and power systems generate power on-site and recover heat from the generation system to meet on-site thermal loads. Waste heat to power systems use waste heat to generate power. You will work with a qualified developer who will design a system that meets your building's heating and cooling needs.

Successor Solar Incentive Program (SuSI)

New Jersey is committed to supporting solar energy. Solar projects help the state reach the renewable goals outlined in the state's Energy Master Plan. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available, but certified solar projects are able to earn one SREC II (Solar Renewable Energy Certificates II) for each megawatt-hour of solar electricity produced from a qualifying solar facility.

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces electric loads at commercial facilities when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. By enabling commercial facilities to reduce electric demand during times of peak demand, the grid is made more reliable, and overall transmission costs are reduced for all ratepayers. Curtailment service providers provide regular payments to medium and large consumers of electric power for their participation in demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

Large Energy User Program (LEUP)

LEUP is designed to promote self-investment in energy efficiency for the largest energy consumers in the state. Customers in this category spend about $5 million a year on energy bills. This program incentivizes owners/users of buildings to upgrade or install energy conserving measures in existing buildings to help offset the capital costs associated with the project. The efficiency upgrades are customized to meet the requirements of the customers' existing facilities, while advancing the State's energy efficiency, conservation, and greenhouse gas reduction goals.

For more details on these programs please visit New Jersey's Clean Energy Program website.

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Ancora Psych Hospital (DMHH) - Boiler House. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs.

TRC conducted this study as part of a comprehensive effort to assist New Jersey educational and local government facilities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

2.1 Site Overview

On December 5, 2023, TRC performed an energy audit at Ancora Psych Hospital (DMHH) - Boiler House located in Hammonton, New Jersey. TRC met with Kyle Irizarry to review the facility operations and help focus our investigation on specific energy-using systems. Ancora Psychiatric Hospital is a 600-bed adult inpatient facility that offers a multidisciplinary team approach to development and implementation of care. Opened in 1955, the Ancora campus consists of multiple buildings across 650 acres.

The Ancora Psych Hospital (DMHH)-Boiler House is a one-story, 8,580 square foot building built in 1953. Spaces include offices, locker room, janitorial area, storage rooms and mechanical space.

The building houses three steam boilers that provide steam to the entire facility. Facility staff are planning a project to upgrade the boiler burners to burn cleaner fuel. According to facility staff, they are also planning to replace the emergency generator.

2.2 Building Occupancy

The facility is fully occupied 24 hours a day, every day of the week.

Building Name	Weekday/Weekend	Operating Schedule
Ancora Psych Hospital (Dmhh)-Boiler Hse	Weekday	12:00 AM - 12:00 AM
	Weekend	12:00 AM - 12:00 AM

Building Occupancy Schedule

2.3 Building Envelope

The walls consist of concrete masonry units (CMUs) over structural steel with a brick veneer and a painted CMU interior finish. The flat roof is supported by steel trusses. Overall, the roof is in good condition and encloses conditioned space.

Most of the windows are single paned with aluminum frames. The glass-to-frame seals are in fair condition, as are the weather seals on the operable windows, which show little evidence of excessive wear.

Exterior doors are made from mix of metal and fiberglass reinforced polymer (FRP) composite material with aluminum frames. They are in fair condition, with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.

Building Envelope

Building Envelope

Overhead Door

Building Door

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps but incorporates a few less efficient 40-Watt T12 fixtures. Fixture types include 2-lamp or 4-lamp, 4-foot-long pendant, and surface-mounted fixtures with linear tube lamps. Typically, T8 fluorescent lamps use electronic ballasts, while T12 fluorescent lamps use magnetic ballasts.

Some of the linear fixtures have been converted to operate with LED tube lamps. Additionally, there are some incandescent and LED general-purpose lamps illuminating areas including corridors, janitorial closets, locker rooms, mechanical rooms, and storage areas.

All exit signs are LED. Most fixtures are in fair condition. Interior lighting levels were generally sufficient. Most light fixtures are controlled manually by wall switches.

Incandescent Lamp

LED "Corn" Lamp

Linear Fluorescent T8 Lamp

LED Linear Tube

Exterior fixtures include a mix of wall packs, floodlights with high-intensity discharge (HID), and LED sources. Exterior light fixtures are mainly controlled by a photocell.

Exterior HID Fixture

Exterior HID Fixture

Exterior LED Fixture

Exterior LED Fixture

2.5 Air Handling Systems

<u>Unitary Electric HVAC Equipment</u>

A few offices areas are cooled by window air conditioning (AC) units with capacities between 5,000 Btu and 15,000 Btu. All units are operating within their useful lifespan, are in fair condition, and are rated as standard efficiency. Newer systems are operated using remote control units located within the space.

Typical Window AC

Typical Window AC

2.6 Steam Heating Systems

Three Cleaver Brooks steam boilers supply steam to the boiler house and much of the campus. One boiler is rated at 28,636 MBh, while the other two are rated at 25,523 MBh each. The burners are fully modulating, and the boilers operate in a manual lead-lag control scheme. Two boilers work at a time, cycling with one boiler as a backup. Boilers are manually changed over as needed. Manufactured in 1982, they are in fair condition. Steam is used directly for heating in this building and is converted to heating hot water and domestic hot water in some buildings.

The boiler system has three feedwater pumps, each rated at 40 hp, operating at constant speed. There are also two, 5 hp condensate return pumps in the mechanical room, along with two additional condensate return pumps in the storage area, each rated at 0.33 hp. All pumps are constant-speed and in fair operating condition.

Most of the supply and return piping is well insulated, and the insulation is in fair condition.

Steam Boiler

Steam Boiler

Radiant Heaters

Boiler Feed Water Pump

Condensate Return Pump

Condensate Return Pump

2.7 Domestic Hot Water

Hot water is produced by a 40-gallon, 4.5 kW electric storage water heater. The hot water heater is standard efficiency and is operating in fair condition. The domestic hot water pipes are partially insulated, and the insulation is in poor condition.

Storage Tank Water Heater

2.8 Refrigeration

The mechanical room has a Scotsman ice maker. The equipment is of standard efficiency and is in fair condition.

Visit https://www.energystar.gov/products/commercial_food_service_equipment for the latest information on high efficiency food service equipment.

Ice Maker

2.9 Plug Load and Vending Machines

You may wish to consider paying particular attention to minimizing your plug load usage. This report makes suggestions for ECMs in this area as well as energy efficient best practices.

There are four computer workstations throughout the facility. Plug loads include general cafe and office equipment. Typical loads include a coffee machine, printer/copier, microwave, and television. There are also battery chargers in the facility's mechanical area.

A residential-style refrigerator in the supervisor's office is used to store food.

Battery Charger

Residential-style Refrigerator

2.10 Water-Using Systems

Water is provided by New Jersey American Water. There is one active onsite well that serves as a secondary water source for emergencies, firefighting, and other uses. Well water is directed to the water tower located on campus. The primary use of water is for drinking, cleaning, cooking, and sanitary fixtures. No water leaks were observed.

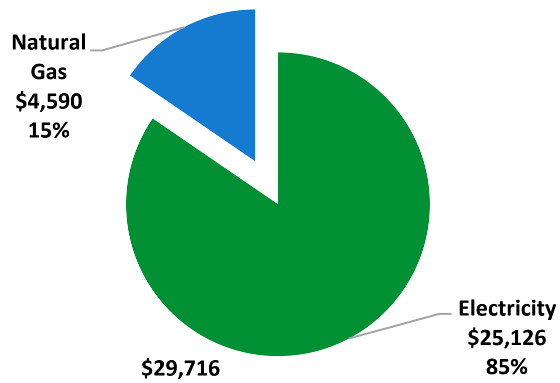
The EPA WaterSense® has set maximum flow rates for sanitary fixtures: 1.28 gallons per flush (gpf) for toilets, 0.5 gpf for urinals, 1.5 gallons per minute (gpm) for lavatory faucets, and 2.0 gpm for showerheads. There are a few restrooms with toilets, urinals, and sinks. Faucet flow rates are 2.2 gpm or higher.

Typical Restroom Faucet

3 Energy Use and Costs

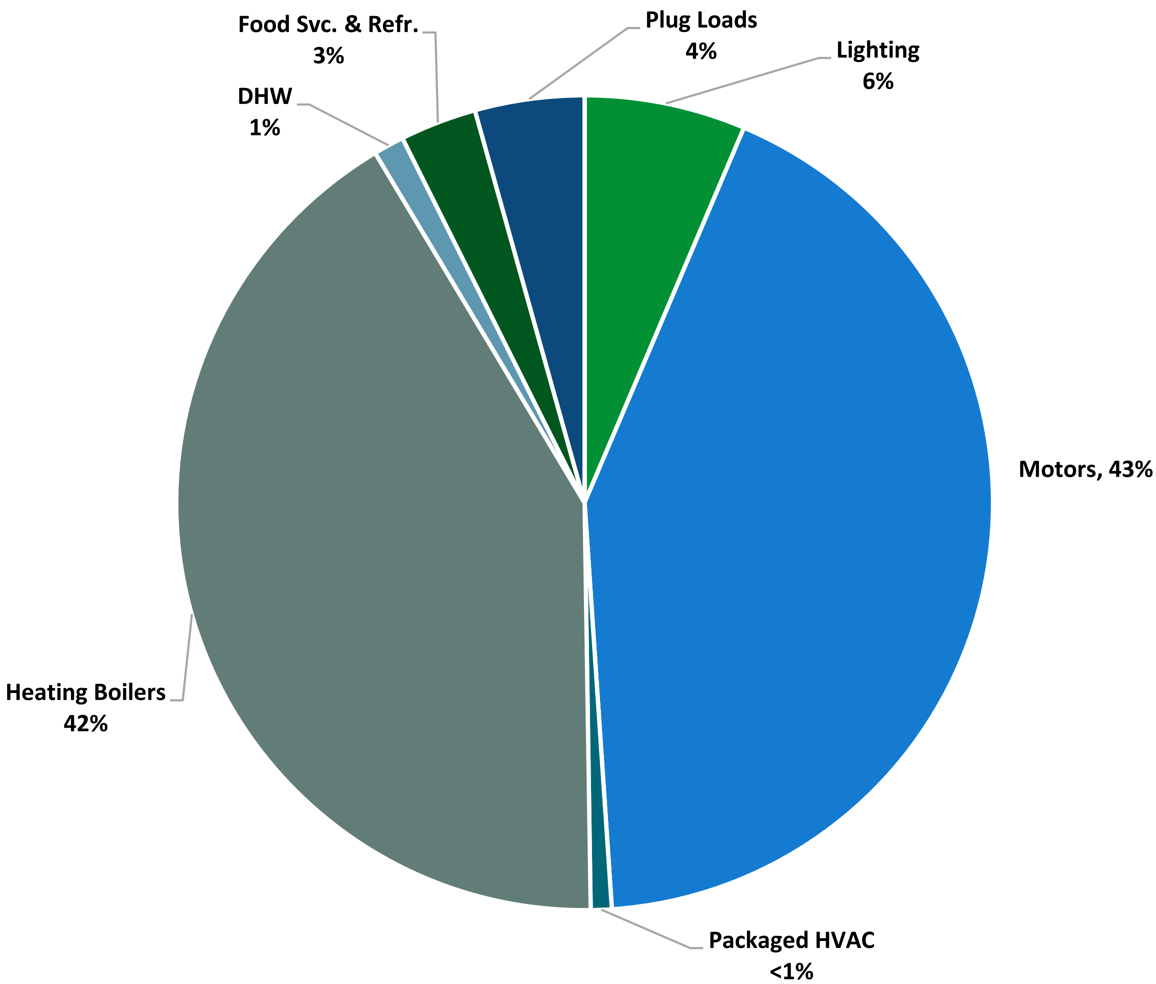
Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	167,744 kWh	$25,126
Natural Gas	4,100 Therms	$4,590
Total		**$29,716**



An energy balance identifies and quantifies energy use in your various building systems. This can highlight areas with the most potential for improvement. This energy balance was developed using calculated energy use for each of the end uses noted in the figure.

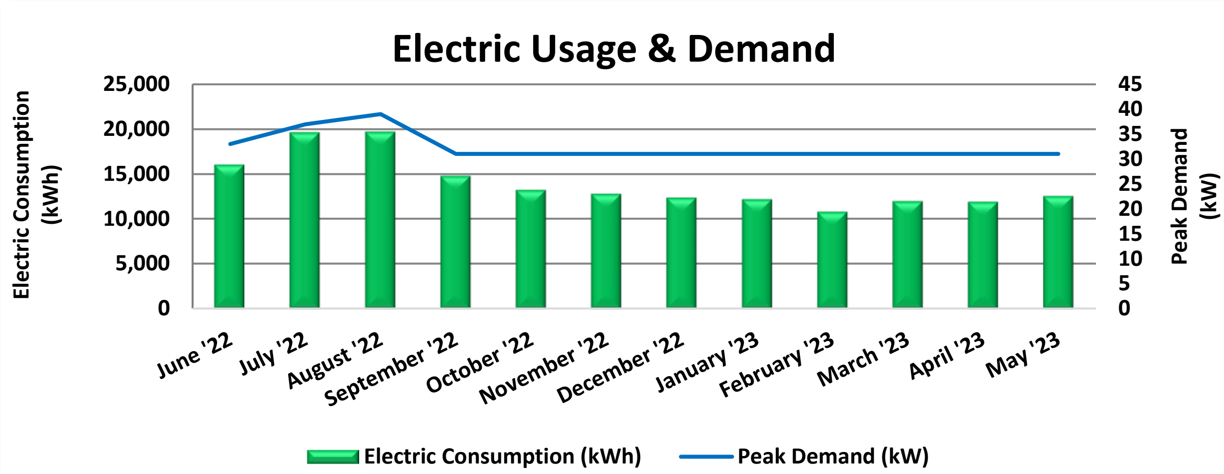
The energy auditor collects information regarding equipment operating hours, capacity, efficiency, and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated energy use is then compared to the historical energy use and the initial inputs are revised, as necessary, to balance the calculated energy use to the historical energy use.



Energy Balance by System

3.1 Electricity

Atlantic City Electric delivers electricity under rate class Monthly General Service Secondary (GSS), with electric production provided by Annual General Service Primary, a third-party supplier.



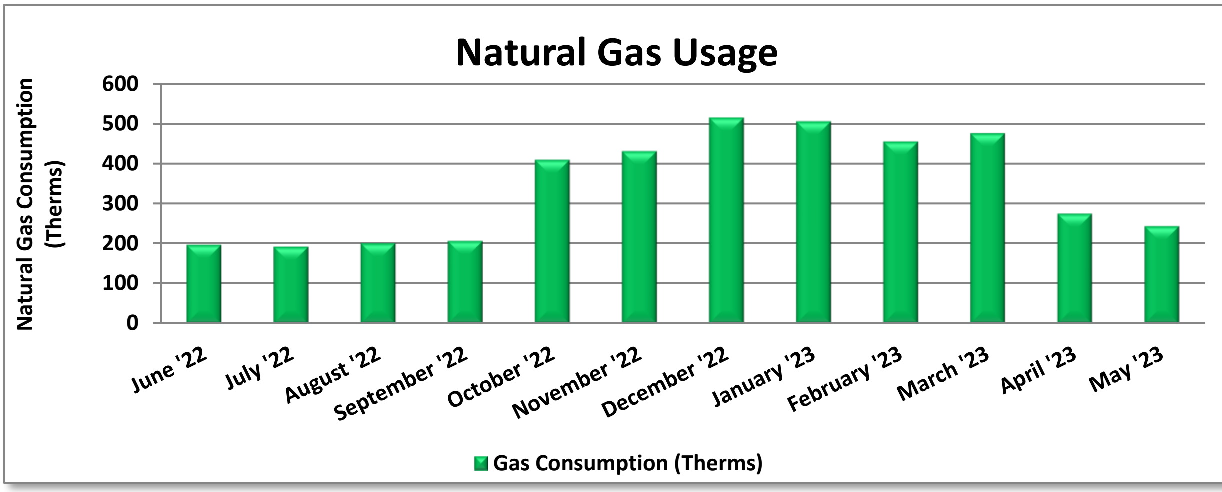
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/30/22	30	15,996	33	$330	$2,302
7/31/22	31	19,600	37	$378	$2,796
8/31/22	31	19,657	39	$398	$2,822
9/30/22	30	14,768	31	$312	$2,147
10/31/22	31	13,208	31	$320	$1,954
11/30/22	30	12,775	31	$309	$1,889
12/31/22	31	12,353	31	$320	$1,927
1/31/23	31	12,195	31	$320	$1,904
2/28/23	28	10,807	31	$289	$1,702
3/31/23	31	11,962	31	$320	$1,875
4/30/23	30	11,900	31	$309	$1,855
5/31/23	31	12,523	31	$320	$1,953
Totals	**365**	**167,744**	**39**	**$3,925**	**$25,126**
Annual	**365**	**167,744**	**39**	**$3,925**	**$25,126**

Notes:

- An estimated peak demand of 39 kW occurred in August '22.
- An estimated average demand over the past 12 months was 32 kW.
- This building is served from the main campus electric meter along with several others. Energy usage (kWh) and demand (kW) was apportioned among those buildings using a formula that accounts for building area (sf), usage, and the energy intensity of the equipment.
- The average electric cost over the past 12 months was $0.150/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

South Jersey Gas delivers natural gas under rate class Comprehensive Transportation Services (SJ-CTS), with natural gas supply provided by UGI, a third-party supplier.



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
6/30/22	30	197	$243
7/31/22	31	192	$242
8/31/22	31	201	$244
9/30/22	30	206	$247
10/31/22	31	409	$401
11/30/22	30	430	$422
12/31/22	31	514	$355
1/31/23	31	505	$595
2/28/23	28	454	$564
3/31/23	31	475	$568
4/30/23	30	274	$370
5/31/23	31	243	$339
Totals	**365**	**4,100**	**$4,590**
Annual	**365**	**4,100**	**$4,590**

Notes:

- The average gas cost for the past 12 months is $1.120/therm, which is the blended rate used throughout the analysis.
- The three boilers which are used to heat most campus areas are located in this building. Central plant natural gas use has been apportioned among the buildings served with steam using a formula that accounts for building area (sf), usage, and the energy intensity of the equipment. As noted, the boiler replacement project considers all the natural gas used by the steam plant in the evaluation of a replacement boiler.

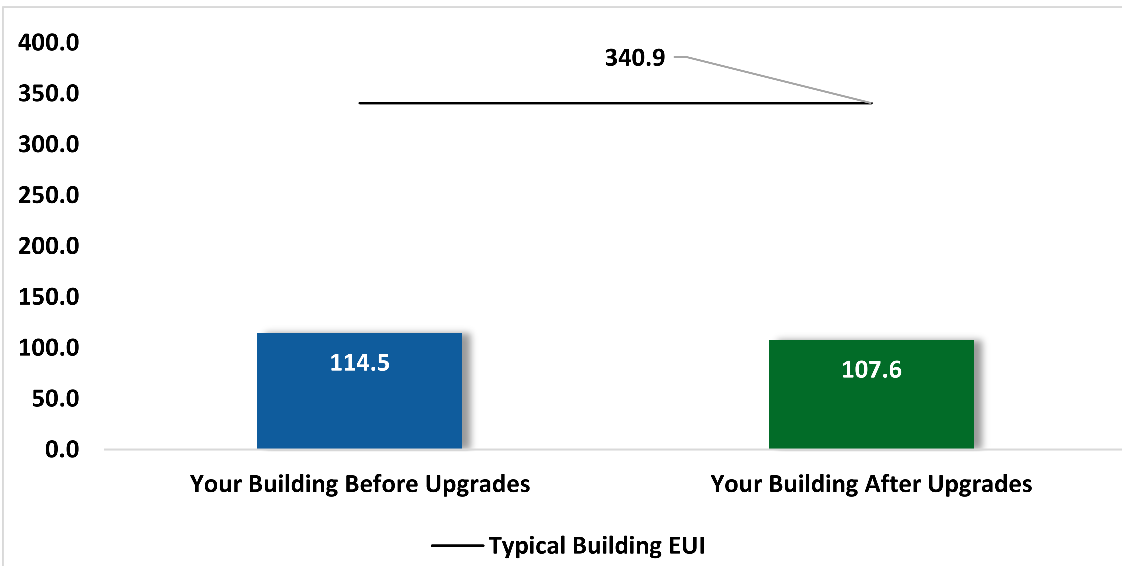
3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's (EPA) Portfolio Manager® software. Benchmarking compares your building's energy use to that of similar buildings across the country, while neutralizing variations due to location, occupancy, and operating hours. Some building types can be scored with a 1-100 ranking of a building's energy performance relative to the national building market. A score of 50 represents the national average and a score of 100 is best.

This ENERGY STAR benchmarking score provides a comprehensive snapshot of your building's energy performance. It assesses the building's physical assets, operations, and occupant behavior, which is compiled into a quick and easy-to-understand score.

Benchmarking Score	N/A

Due to its unique characteristics, this building type is not able to receive a benchmarking score. This report contains suggestions about how to improve building performance and reduce energy costs.



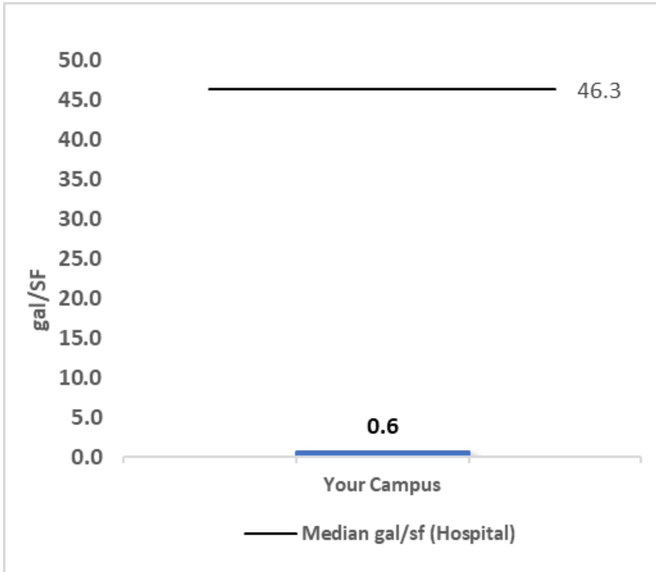
Energy Use Intensity Comparison[5]

Energy use intensity (EUI) measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. Several factors can cause a building to vary from typical energy usage. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and occupant behavior all contribute to a building's energy use and the benchmarking score.

Note that the typical building EUI used in this report refers to the national median energy use intensity for a "specialty hospital" and does not correlate with the energy use intensity of a particular building. Specifically, buildings with lower occupancy periods or less equipment typically use less energy.

[5] Based on all evaluated ECMs

Campus Water Benchmarking



A benchmark is provided for your campus's water use based on the annual water use in gallons per square foot of building area (gal/sf-yr). Your building is compared to other similar buildings based on average water usage as available from the 2012 Commercial Buildings Energy Consumption Survey (CBECS) and from the EPA ENERGY STAR DataTrends Water Use Tracking database.

New Jersey American Water supplies water to the campus. This building, along with several others, shares the main campus water meter. The water bill is not divided among these buildings, so it covers the metered water usage for multiple buildings on campus. This information has been included in the report for the Main Hospital. Additional use of unmetered well water may contribute slightly to overall water consumption. Water use varies considerably depending mainly on the extent of indoor water use and whether process water is used, such as for laundry equipment. Sanitary fixtures may use varying amounts of water.

Tracking your Energy Performance

Keeping track of your energy and water use on a monthly basis is one of the best ways to keep utility costs in check and keep your facility operating efficiently. Update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance.

We have created a Portfolio Manager account for your facility and have already entered the monthly utility data shown above for you. Account login information for your account will be sent via email.

Free online training is available to help you use ENERGY STAR Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training.

For more information on ENERGY STAR and Portfolio Manager, visit their website.

3.4 Understanding Your Utility Bills

The State of New Jersey Department of the Public Advocate provides detailed information on how to read natural gas and electric bills. Your bills contain important information including account numbers, meter numbers, rate schedules, meter readings, and the supply and delivery charges. Gas and electric bills both provide comparisons of current energy consumption with prior usage.

Sample bills, with annotation, may be viewed at:
https://www.nj.gov/rpa/docs/Understanding_Electric_Bill.pdf
https://www.nj.gov/rpa/docs/Understanding_Gas_Bill.pdf

Why Utility Bills Vary

Utility bills vary from one month to another for many reasons. For this reason, assessing the effects of your energy savings efforts can be difficult.

Billing periods vary, typically ranging between 28 and 33 days. Electric bills provide the kilowatt-hours (kWh) used per month while gas bills provide therms (or hundreds of cubic feet - CCF) per month consumption information. Monthly consumption information can be helpful as a tool to assess your efforts to reduce energy, particularly when compared to monthly usage from a similar calendar period in a prior year.

Bills typically vary seasonally, often with more gas consumed in the winter for heating, and more electricity used in the summer when air conditioning is used. Facilities with electric heating may experience higher electricity use in the winter. Seasonal variance will be impacted by the type of heating and cooling systems used. Normal seasonal fluctuations are further impacted by the weather. Extremely cold or hot weathers causes HVAC equipment to run longer, increasing usage. Other monthly fluctuations in usage can be caused by changes in building occupancy. Utility bills provide a comparison of usage between the current period and comparable billing month period of the prior year. Year-to-year monthly use comparisons can point to trends with energy savings for measures/projects that were implemented within the timeframe, but these comparisons do not account for changing weather of occupancy patterns.

The price of fuel and purchased power used to produce and delivery electricity and gas fluctuates. Any increase or decrease in these costs will be reflected in your monthly bill. Additionally, billing rates occasionally change after justification and approval of the NJBPU. For this reason, it is more useful to review energy use rather than cost when assessing energy use trends or the impact of energy conservation measures implemented.

4 Energy Conservation Measures

The goal of this audit report is to identify and evaluate potential energy efficiency improvements and provide information about the cost effectiveness of those improvements. Most energy conservation measures have received preliminary analysis of feasibility, which identifies expected ranges of savings. This level of analysis is typically sufficient to demonstrate project cost-effectiveness and help prioritize energy measures.

Calculations of energy use and savings are based on the current version of the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NJBPU. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances.

Operation and maintenance costs for the proposed new equipment will generally be lower than the current costs for the existing equipment—especially if the existing equipment is at or past its normal useful life. We have conservatively assumed there to be no impact on overall maintenance costs over the life of the equipment.

Financial incentives in this report are based on the previously run state rebate program SmartStart, which has been retired. Now, all investor-owned gas and electric utility companies are offering complementary energy efficiency programs directly to their customers. Some measures and proposed upgrades may be eligible for higher incentives than those shown below. The incentives in the summary tables should be used for high-level planning purposes. To verify incentives, reach out to your utility provider or visit the NJCEP website for more information.

For a detailed list of the locations and recommended energy conservation measures for all inventoried equipment, see Appendix A: Equipment Inventory & Recommendations.

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**5,547**	**0.4**	**-1**	**$820**	**$2,120**	**$250**	**$1,870**	**2.3**	**5,471**
ECM 1	Install LED Fixtures	Yes	1,288	0.0	0	$193	$1,320	$100	$1,220	6.3	1,297
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	515	0.0	0	$76	$90	$10	$80	1.1	505
ECM 3	Retrofit Fixtures with LED Lamps	Yes	3,744	0.3	-1	$551	$710	$140	$570	1.0	3,669
Lighting Control Measures			**3,283**	**0.3**	**-1**	**$483**	**$1,650**	**$200**	**$1,450**	**3.0**	**3,218**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	3,283	0.3	-1	$483	$1,650	$200	$1,450	3.0	3,218
Variable Frequency Drive (VFD) Measures			**6,214**	**1.0**	**0**	**$931**	**$11,700**	**$1,800**	**$9,900**	**10.6**	**6,258**
ECM 5	Install VFDs on Condensate Pumps	No	6,214	1.0	0	$931	$11,700	$1,800	$9,900	10.6	6,258
HVAC System Improvements			**347**	**0.0**	**0**	**$52**	**$110**	**$20**	**$90**	**1.7**	**349**
ECM 6	Install Pipe Insulation	Yes	347	0.0	0	$52	$110	$20	$90	1.7	349
Domestic Water Heating Upgrade			**305**	**0.0**	**0**	**$46**	**$120**	**$30**	**$90**	**2.0**	**307**
ECM 7	Install Low-Flow DHW Devices	Yes	305	0.0	0	$46	$120	$30	$90	2.0	307
Custom Measures			**2,082**	**0.0**	**0**	**$312**	**$2,500**	**$0**	**$2,500**	**8.0**	**2,097**
ECM 8	Replace Electric Water Heater with Heat Pump Water Heater	No	2,082	0.0	0	$312	$2,500	$0	$2,500	8.0	2,097
TOTALS			**17,778**	**1.6**	**-2**	**$2,644**	**$18,200**	**$2,300**	**$15,900**	**6.0**	**17,700**

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

All Evaluated Energy Improvements for Boiler House

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**1,752**	**$19,612**	**$2,947,500**	**$0**	**$2,947,500**	**150.3**	**205,171**
ECM 9	Install High Efficiency Steam Boilers	No	0	0.0	1,752	$19,612	$2,947,500	$0	$2,947,500	150.3	205,171
TOTALS			**0**	**0.0**	**1,752**	**$19,612**	**$2,947,500**	**$0**	**$2,947,500**	**150.3**	**205,171**

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Boiler Replacement Energy Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**5,547**	**0.4**	**-1**	**$820**	**$2,120**	**$250**	**$1,870**	**2.3**	**5,471**
ECM 1	Install LED Fixtures	1,288	0.0	0	$193	$1,320	$100	$1,220	6.3	1,297
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	515	0.0	0	$76	$90	$10	$80	1.1	505
ECM 3	Retrofit Fixtures with LED Lamps	3,744	0.3	-1	$551	$710	$140	$570	1.0	3,669
Lighting Control Measures		**3,283**	**0.3**	**-1**	**$483**	**$1,650**	**$200**	**$1,450**	**3.0**	**3,218**
ECM 4	Install Occupancy Sensor Lighting Controls	3,283	0.3	-1	$483	$1,650	$200	$1,450	3.0	3,218
HVAC System Improvements		**347**	**0.0**	**0**	**$52**	**$110**	**$20**	**$90**	**1.7**	**349**
ECM 6	Install Pipe Insulation	347	0.0	0	$52	$110	$20	$90	1.7	349
Domestic Water Heating Upgrade		**305**	**0.0**	**0**	**$46**	**$120**	**$30**	**$90**	**2.0**	**307**
ECM 7	Install Low-Flow DHW Devices	305	0.0	0	$46	$120	$30	$90	2.0	307
TOTALS		**9,482**	**0.6**	**-2**	**$1,401**	**$4,000**	**$500**	**$3,500**	**2.5**	**9,345**

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**5,547**	**0.4**	**-1**	**$820**	**$2,120**	**$250**	**$1,870**	**2.3**	**5,471**
ECM 1	Install LED Fixtures	1,288	0.0	0	$193	$1,320	$100	$1,220	6.3	1,297
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	515	0.0	0	$76	$90	$10	$80	1.1	505
ECM 3	Retrofit Fixtures with LED Lamps	3,744	0.3	-1	$551	$710	$140	$570	1.0	3,669

When considering lighting upgrades, we suggest using a comprehensive design approach that simultaneously upgrades lighting fixtures and controls to maximize energy savings and improve occupant lighting. Comprehensive design will also consider appropriate lighting levels for different space types to make sure that the right amount of light is delivered where needed. If conversion to LED light sources is proposed, we suggest converting all of a specific lighting type (e.g., linear fluorescent) to LED lamps to minimize the number of lamp types in use at the facility, which should help reduce future maintenance costs.

ECM 1: Install LED Fixtures

Replace existing fixtures containing HID lamps with new LED light fixtures. This measure saves energy by installing LEDs, which use less power than other technologies with a comparable light output.

In some cases, HID fixtures can be retrofit with screw-based LED lamps. Replacing an existing HID fixture with a new LED fixture will generally provide better overall lighting optics; however, replacing the HID lamp with a LED screw-in lamp is typically a less expensive retrofit. We recommend you work with your lighting contractor to determine which retrofit solution is best suited to your needs and will be compatible with the existing fixtures.

Maintenance savings may also be achieved since LED lamps last longer than other light sources and therefore do not need to be replaced as often.

Affected Building Areas: exterior fixtures

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Retrofit fluorescent fixtures by removing the fluorescent tubes and ballasts and replacing them with LED tubes and LED drivers (if necessary), which are designed to be used in retrofitted fluorescent fixtures.

The measure uses the existing fixture housing but replaces the electric components with more efficient lighting technology, which use less power than other lighting technologies but provides equivalent lighting output. Maintenance savings may also be achieved since LED tubes last longer than fluorescent tubes and, therefore, do not need to be replaced as often.

Affected Building Areas: mechanical room T12 fixture

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent or incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies. Be sure to specify replacement lamps that are compatible with existing dimming controls, where applicable. In some circumstances, you may need to upgrade your dimming system for optimum performance.

This measure saves energy by installing LEDs, which use less power than other lighting technologies yet provide equivalent lighting output for the space. Maintenance savings may also be available, as longer-lasting LEDs lamps will not need to be replaced as often as the existing lamps.

Affected Building Areas: all areas with fluorescent fixtures with T8 tubes and incandescent lamps: locker room

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**3,283**	**0.3**	**-1**	**$483**	**$1,650**	**$200**	**$1,450**	**3.0**	**3,218**
ECM 4	Install Occupancy Sensor Lighting Controls	3,283	0.3	-1	$483	$1,650	$200	$1,450	3.0	3,218

Lighting controls reduce energy use by turning off or lowering lighting fixture power levels when not in use. A comprehensive approach to lighting design should upgrade the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 4: Install Occupancy Sensor Lighting Controls

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend that lighting controls use dual technology sensors, which reduce the possibility of lights turning off unexpectedly.

Occupancy sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Most occupancy sensor lighting controls allow users to manually turn fixtures on/off, as needed. Some controls can also provide dimming options.

Occupancy sensors can be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are best suited to single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in large spaces, locations without local switching, and where wall switches are not in the line-of-sight of the main work area.

This measure provides energy savings by reducing the lighting operating hours.

Affected Building Areas: offices, locker room, and mechanical room

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**6,214**	**1.0**	**0**	**$931**	**$11,700**	**$1,800**	**$9,900**	**10.6**	**6,258**
ECM 5	Install VFDs on Condensate Pumps	6,214	1.0	0	$931	$11,700	$1,800	$9,900	10.6	6,258

Variable frequency drives control motors for fans, pumps, and process equipment based on the actual output required of the driven equipment. Energy savings result from more efficient control of motor energy usage when equipment operates at partial load. The magnitude of energy savings depends on the estimated amount of time that the motor would operate at partial load. For equipment with proposed

VFDs, we have included replacing the controlled motor with a new inverter duty rated motor to conservatively account for the cost of an inverter duty rated motor.

ECM 5: Install VFDs on Condensate Pumps

We evaluated installing VFDs to control the condensate return pumps. The condensate pump flow will have to be controlled to work in conjunction with the boiler feed water pump. The VFD control feedback should be based on a pressure transducer located in the main steam header. Before implementing this measure co-ordinate with the pump and boiler manufacturer.

Energy savings result from reducing the pump motor speed (and power) at reduced condensate flow from the condensate receiver. The magnitude of energy savings is based on the estimated amount of time that the pumping system will operate at reduced load.

4.4 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**347**	**0.0**	**0**	**$52**	**$110**	**$20**	**$90**	**1.7**	**349**
ECM 6	Install Pipe Insulation	347	0.0	0	$52	$110	$20	$90	1.7	349

ECM 6: Install Pipe Insulation

Install insulation on domestic hot water system piping. Distribution system thermal losses are dependent on system fluid temperature, the size of the distribution system, and the extent and condition of piping insulation. When the insulation has been damaged due to exposure to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated, system thermal efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Affected Systems: domestic hot water piping

4.5 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**305**	**0.0**	**0**	**$46**	**$120**	**$30**	**$90**	**2.0**	**307**
ECM 7	Install Low-Flow DHW Devices	305	0.0	0	$46	$120	$30	$90	2.0	307

ECM 7: Install Low-Flow DHW Devices

Install low-flow devices to reduce overall hot water demand. The following low-flow devices are recommended to reduce hot water usage:

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm
Faucet aerator (kitchen)	1.5 gpm
Showerhead	2.0 gpm
Pre-rinse spray valve (kitchen)	1.28 gpm

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing.

4.6 Custom Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Custom Measures		**2,082**	**0.0**	**0**	**$312**	**$2,500**	**$0**	**$2,500**	**8.0**	**2,097**
ECM 8	Replace Electric Water Heater with Heat Pump Water Heater	2,082	0.0	0	$312	$2,500	$0	$2,500	8.0	2,097

ECM 8: Replace Electric Water Heater with Heat Pump Water Heater

We evaluated replacing the existing electric water heater with a heat pump water heater (HPWH).

A typical electric water heater uses electric resistance coils to heat water at a coefficient of performance (COP) of 1. Air source heat pump water heaters use a refrigeration cycle to transfer heat from the surrounding air to the domestic water. The typical average COP for a HPWH is about 2.5, so they require significantly less electricity to produce the same amount of hot water as a traditional electric water heater. There are two types of HPWH, those integrated with the heat pump and storage tank in the same unit, and those that are split into two sections (with the storage tank separate from the heat pump). The following addresses integrated HPWH.

HPWH reject cold air. As such, they need to be installed in an unconditioned space of about 750 cubic feet with good ventilation. Ideal locations are garages, large enclosed, unconditioned storage areas, or areas with excess heat such as a furnace or boiler room.[6] The HPWH will also produce condensate so accommodations for draining the condensate need to be provided.

Most HPWH operate effectively down to an air temperature of 40 °F. Below that temperature, an electric resistance booster heater is typically required to achieve full heating capacity. It is critical that the HPWH controls are set up so that the electric resistance heat only engages when the air temperature is too cold for the HPWH to extract heat from it. HPWHs have a slow recovery. During periods of high demand, the electric resistance heating element, if enabled, may be energized to maintain set point, thus reducing the overall efficiency of the unit. It is recommended that a careful analysis of the hot water demand be conducted to determine if the application makes economic sense, and the HPWH heating capacity and storage are properly sized.

[6] https://basc.pnnl.gov/code-compliance/heat-pump-water-heaters-code-compliance-brief#:~:text=HPWH%20must%20have%20unrestricted%20airflow,depending%20on%20size%20of%20system

HPWH operate most effectively when the temperature difference between the incoming and outgoing water is high. Generally, this means that cold make-up water should be piped to the bottom of the tank and return water should be piped to the top of the tank to maintain stratification within the storage tank. Water should be drawn from the bottom of the tank to be heated. If there is a DHW recirculation pump, it should only be operated during high hot water demand periods.

Affected Units: domestic tank water heater

4.7 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**1,752**	**$19,612**	**$2,947,500**	**$0**	**$2,947,500**	**150.3**	**205,171**
ECM 9	Install High Efficiency Steam Boilers	0	0.0	1,752	$19,612	$2,947,500	$0	$2,947,500	150.3	205,171

ECM 9: Install High Efficiency Steam Boilers

We evaluated replacing the older inefficient steam boilers with high-efficiency steam boilers. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

For the purpose of this analysis, we evaluated the replacement of boilers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load. In many cases installing multiple modular boilers, rather than one or two large boilers, will result in higher overall plant efficiency while providing additional system redundancy.

Replacing the boilers has a long payback based on energy savings and may not be justifiable based simply on energy considerations. However, the boilers have reached the end of their normal useful life. Typically, the marginal cost of purchasing high-efficiency boilers can be justified by the marginal savings from the improved efficiency. When the boiler is eventually replaced, consider purchasing boilers that exceed the minimum efficiency required by building codes.

Note that we have used an estimated 80% baseline boiler efficiency in our calculations, which is conservative considering possible degradation in efficiency based on system age and operations. We recommend facility staff conduct boiler efficiency testing and evaluate the replacement of boilers accordingly.

4.8 Measures for Future Consideration

There are additional opportunities for improvement that State of NJ Department of Human Services may wish to consider. These potential upgrades typically require further analysis, involve substantial capital investment, and/or include significant system reconfiguration. These measures are therefore beyond the scope of this energy audit. These measures are described here to support a whole building approach to energy efficiency and sustainability.

State of NJ Department of Human Services may wish to consider the Energy Savings Improvement Program (ESIP) or other whole building approach. With interest in implementing comprehensive, largescale and/or complex system wide projects, these measures may be pursued during development of a future energy savings plan. We recommend that you work with your energy service company (ESCO) and/or design team to:

- Evaluate these measures further.
- Develop firm costs.
- Determine measure savings.
- Prepare detailed implementation plans.

Other modernization or capital improvement funds may be leveraged for these types of refurbishments. As you plan for capital upgrades, be sure to consider the energy impact of the building systems and controls being specified.

Installation of a Building Automation System

Most larger facilities have some type of building automation system (BAS), which provides for centralization, remote control, and monitoring of HVAC equipment and sometimes lighting or other building systems. A BAS utilizes a system of temperature and pressure sensors that obtain feedback about field conditions and provide signals to control systems that adjust HVAC system operation for optimal functioning. Thirty years ago, most control systems were pneumatic systems driven by compressed air, with pneumatic thermostats and air driven actuators for valves and dampers. Pneumatics controls have largely been replaced by direct digital control (DDC) systems, but many pneumatic systems remain. Contemporary DDC systems afford tighter controls and enhanced monitoring and trending capabilities as compared to the older systems.

Often smaller facilities are not equipped with central controls. For many small sites, it has been less costly to install distributed local controls, such as programmable thermostats and timeclocks, rather than centralized DDC. Local controls do a reasonably good job of scheduling equipment and maintaining operating conditions by relying on controls integral to HVAC units, such as logic for compressor staging, to manage the equipment operating algorithms.

Even for smaller sites, inefficiencies arise when temperature sensors and thermostat schedules are not maintained, when there are separate systems for heating and cooling, and especially when equipment is added, or the facility is reconfigured or repurposed.

Based on our survey, it appears that the installation of a BAS at your site could increase the efficiency of your building HVAC system operation.

A controls upgrade would enable automated equipment to start and stop times, temperature setpoints, and lockouts and deadbands to be programmed remotely using a graphic interface. Controls can be configured to optimize ventilation and outside air intake by adjusting economizer position, damper function, and fan speed. Existing chilled and hot water distribution system controls are typically tied in, including associated pumps and valves. Coordinated control of HVAC systems is dependent on a network of sensors and status points. A comprehensive building control system provides monitoring and control for all HVAC systems, so operators can adjust system programming for optimal comfort and energy savings.

It is recommended that an HVAC engineer or contractor who specializes in BAS be contacted for a detailed evaluation and implementation costs. For the purposes of this report, the potential energy savings and measure costs were estimated based on industry standards and previous project experience. Further analysis should be conducted for the feasibility of this measure. This is not an investment grade analysis nor should be used as a basis for design and construction.

Electric Sub Metering

Electricity use varies in different facilities, and plant operators need to perform their own investigations and analyses to understand how their facilities consume energy. Utility bills indicate how much energy a facility uses across the entire facility, but submetering provides more detailed data on the energy consumption of specific systems and even on individual pieces of equipment, depending on how extensively meters are installed. Electric submeters alone do not save energy, but they are a useful tool under the right circumstances. Electric sub-meters can provide facility staff with real-time energy use data for specific buildings and equipment, information that enhances the potential for greater energy management activities. Revenue grade submeters are a tool that allow operators to better understand how and where electricity is used at the facility. Better resolution of system energy use can lead to operational changes or even equipment modifications or replacement, which often result in reduced energy use, which often result in reduced energy use.

Upgrade to a Heat Pump System

Electric resistance heating units work by passing an electric current through wires to heat them. The system is 100% efficient since for every unit of electricity consumed, one unit of heat is produced.

But there is a way to convert electricity to create heat at better than a 1:1 ratio. Heat pumps operate on a more efficient principle, the refrigeration cycle. Instead of directly converting electricity to heat, electricity does the work, via a compressor, of moving refrigerant through a system that transfers heat from a cooler place to a warmer place. That system can move three to five as much energy as is available using electric resistance heating methods. Heat pumps work in a similar manner to an air conditioner, except they reverse the cooling process to circulate warm air instead of cold air. Also, heat pumps are generally capable of dispensing refrigerated air as they can typically be operated in air conditioning mode.

Electric resistance heat, including electric furnaces and baseboard heaters, can be inexpensive to install but often expensive to run. Facilities with these systems can save substantial energy at a moderate cost by installing a heat pump when they replace a central air conditioner.

Even in buildings without central air-conditioning, there are opportunities to save energy when an existing electric furnace needs to be replaced, as well as opportunities to install ductless electric heat pumps in buildings with baseboard electric heaters and electric fan coils. Unit ventilators with built-in electric resistance heaters can be replaced with unit ventilators with integrated heat pumps.

Electric heat pumps have high coefficient of performance (COP) ratings and are substantially more efficient than traditional electric heating systems. Further investigation is required to determine whether installing a heat pump system is a cost-effective solution when replacing existing electrical heating systems.

5 Energy Efficient Best Practices

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs.

Operation and maintenance (O&M) plans enhance the operational efficiency of HVAC and other energy intensive systems and could save 5% –20% of the energy usage in your building without substantial capital investment. A successful plan includes your records of energy usage trends and costs, building equipment lists, current maintenance practices, and planned capital upgrades, and it incorporates your ideas for improved building operation. Your plan will address goals for energy-efficient operation, provide detail on how to reach the goals, and outline procedures for measuring and reporting whether goals have been achieved.

You may already be doing some of these things—see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR Portfolio Manager

You've heard it before—you cannot manage what you do not measure. ENERGY STAR Portfolio Manager is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions[7]. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Weatherization

Caulk or weather strip leaky doors and windows to reduce drafts and loss of heated or cooled air. Sealing cracks and openings can reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. Materials used may include caulk, polyurethane foam, and other weather-stripping materials. There is an energy savings opportunity by reducing the uncontrolled air exchange between the outside and inside of the building. Blower door assisted comprehensive building air sealing will reduce the amount of air exchange, which will in turn reduce the load on the buildings heating and cooling equipment, providing energy savings and increased occupant comfort.

Doors and Windows

Close exterior doors and windows in heated and cooled areas. Leaving doors and windows open leads to a loss of heat during the winter and chilled air during the summer. Reducing air changes per hour can lead to increased occupant comfort as well as heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Window Treatments/Coverings

Use high-reflectivity films or cover windows with shades or shutters to reduce solar heat gain and reduce the load on cooling and heating systems. Older, single-pane windows and east- or west-facing windows are especially prone to solar heat gain. In addition, use shades or shutters at night during cold weather to reduce heat loss.

[7] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager

Lighting Maintenance

Clean lamps, reflectors and lenses of dirt, dust, oil, and smoke buildup every six to twelve months. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust. Together, this can reduce total light output by up to 60% while still drawing full power.

In addition to routine cleaning, developing a maintenance schedule can ensure that maintenance is performed regularly, and it can reduce the overall cost of fixture re-lamping and re-ballasting. Group re-lamping and re-ballasting maintains lighting levels and minimizes the number of site visits by a lighting technician or contractor, decreasing the overall cost of maintenance.

Lighting Controls

As part of a lighting maintenance schedule, test lighting controls to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight and photocell sensors, maintenance involves cleaning sensor lenses and confirming that setpoints and sensitivity are configured properly. Adjust exterior lighting time clock controls seasonally as needed to match your lighting requirements.

Motor Controls

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Whenever possible, use automatic devices such as twist timers or occupancy sensors to turn off motors when they are not needed.

Motor Maintenance

Motors have many moving parts. As these parts degrade over time, the efficiency of the motor is reduced. Routine maintenance prevents damage to motor components. Routine maintenance should include cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Thermostat Schedules and Temperature Resets

Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. Thermostats should be programmed for a setback of 5°F-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

AC System Evaporator/Condenser Coil Cleaning

Dirty evaporator and condenser coils restrict air flow and restrict heat transfer. This increases the loads on the evaporator and condenser fan and decreases overall cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

HVAC Filter Cleaning and Replacement

Air filters should be checked regularly (often monthly) and cleaned or replaced when appropriate. Air filters reduce indoor air pollution, increase occupant comfort, and help keep equipment operating efficiently. If the building has a building management system, consider installing a differential pressure switch across filters to send an alarm about premature fouling or overdue filter replacement. Over time, filters become less and less effective as particulate buildup increases. Dirty filters also restrict air flow through the air conditioning or heat pump system, which increases the load on the distribution fans.

Steam Trap Repair and Replacement

Steam traps are a crucial part of delivering heat from the boiler to the space heating units. Steam traps are automatic valves that remove condensate from the system. If the traps fail closed, condensate can build up in the steam supply side of the trap, which reduces the flow in the steam lines and thermal capacity of the radiators. Or they may fail open, allowing steam into the condensate return lines resulting in wasted energy, water, and hammering. Losses can be significantly reduced by testing and replacing equipment as they start to fail. Repair or replace traps that are blocked or allowing steam to pass. Inspect steam traps as part of a regular steam system maintenance plan.

Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely and efficiently. Boilers should be cleaned according to the manufacturer's instructions to remove soot and scale from the boiler tubes to improve heat transfer.

Optimize HVAC Equipment Schedules

Energy management systems (BAS) typically provide advanced controls for building HVAC systems, including chillers, boilers, air handling units, rooftop units and exhaust fans. The BAS monitors and reports operational status, schedules equipment start and stop times, locks out equipment operation based on outside air or space temperature, and often optimizes damper and valve operation based on complex algorithms. These BAS features, when in proper adjustment, can improve comfort for building occupants and save substantial energy.

Know your BAS scheduling capabilities. Regularly monitor HVAC equipment operating schedules and match them to building operating hours to eliminate unnecessary equipment operation and save energy. Monitoring should be performed often at sites with frequently changing usage patterns – daily in some cases. We recommend using the optimal start feature of the BAS (if available) to optimize the building warmup sequence. Most BAS scheduling programs provide for holiday schedules, which can be used during reduced use or shutdown periods. Finally, many systems are equipped with a one-time override function, which can be used to provide additional space conditioning due to a one-time, special event. When available this override feature should be used rather than changing the base operating schedule.

Water Heater Maintenance

The lower the supply water temperature that is used for hand washing sinks, the less energy is needed to heat the water. Reducing the temperature results in energy savings and the change is often unnoticeable to users. Be sure to review the domestic water temperature requirements for sterilizers and dishwashers as you investigate reducing the supply water temperature.

Also, preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Annual checks should include checks for:

- Leaks or heavy corrosion on the pipes and valves.
- Corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot, or charred metal, this is a sign you may be having combustion issues, and you should have the unit serviced by a professional.
- For electric water heaters, look for signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank.
- For water heaters more than three years old, have a technician inspect the sacrificial anode annually.

Procurement Strategies

Purchasing efficient products reduces energy costs without compromising quality. Consider modifying your procurement policies and language to require ENERGY STAR products where available.

6 Water Best Practices

Getting Started

The commercial and institutional sector is the second largest consumer of publicly supplied water in the United States, accounting for 17% of the withdrawals from public water supplies[8]. In New Jersey, excluding water used for power generation, approximately 80% of total water use was attributed to potable supply during the period of 2009 to 2018. Water withdrawals for potable supply have not changed noticeably during the period from 1990 to 2018[9].

Water management planning serves as the foundation for any successful water reduction effort. It is the first step a commercial or institutional facility owner or manager should take to achieve and sustain long-term water savings. Understanding how water is used within a facility is critical for the water management planning process. A water assessment provides a comprehensive account of all known water uses at the facility. It allows the water management team to establish a baseline from which progress and program success can be measured. It also enables the water management team to set achievable goals and identify and prioritize specific projects based on the relative savings opportunities and project cost-effectiveness.

Water conservation devices may significantly reduce your water and sewer usage costs. Any reduction in water use reduces grid-level electricity use since a significant amount of electricity is used to treat and deliver water from reservoirs to end users.

For more information regarding water conservation or additional details regarding the practices shown below go to the EPA's WaterSense website[10] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[11] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Leak Detection and Repair

Identifying and repairing leaks and other water use anomalies within a facility's water distribution system or from processes or equipment can keep a facility from wasting significant quantities of water. Examples of common leaks include leaking toilets and faucets, drip irrigation malfunctions, stuck float valves, and broken distribution lines. Reading meters, installing failure abatement technologies, and conducting visual and auditory inspections are important best practices to detect leaks. Train building occupants, employees, and visitors to report any leaks that they detect. To reduce unnecessary water loss, detected leaks should be repaired quickly. Repairing leaks in water distribution that is pressurized by on-site pumps or in heated or chilled water piping will also reduce energy use.

Toilets and Urinals

Toilets and urinals are considered sanitary fixtures and are found in most facilities. High efficiency fixtures are at least 20% more efficient than available standard products. Leaking or damaged equipment is a substantial source of water waste. Train users to report continuously flushing, leaking, or otherwise improperly operating equipment to the appropriate personnel. Depending on the age of the equipment

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[8] Estimated from analyzing data in: Solley, Wayne B,. et al, "Estimated Use of Water in the United States in 1995", U.S Geological Survey Circular 1200, (1998)

[9] https://dep.nj.gov/wp-content/uploads/dsr/trends-water-supply.pdf

[10] https://www.epa.gov/watersense

[11] https://www.epa.gov/watersense/watersense-work-0

and the frequency of use, it may be cost effective to replace older inefficient fixtures with current generation WaterSense labeled equipment.

Commercial facilities typically use tank toilets or wall-mount flushometers. Educate and inform users with restroom signage and other means to avoid flushing inappropriate objects. For tank toilets, periodically check to ensure fill valves are working properly and that water level is set correctly. Annually test toilets to ensure the flappers are not worn or allowing water to seep from the tank into the bowl and down the sewer. Control stops and piston valves on flushometer toilets should be checked at least annually.

Most urinals use water to flush liquid. These standard single-user fixtures are present in most facilities. Non-water urinals use a specially designed trap that allows liquid waste to drain out of the fixture through a trap seal, and into the drainage system. Flushing urinals should be inspected at least annually for proper valve and sensor operation. For non-water urinals, follow maintenance practices as directed by the manufacturer to ensure products perform as expected. Non-water urinals can be considered during urinal replacement, however, review the condition and design of the existing plumbing system and the expected usage patterns to ensure that these products will provide the anticipated performance.

Faucets and Showerheads

Faucets and showerheads are sanitary fixtures that generally dispense heated water. Reducing water use by these fixtures translates into a reduction of site fuel or electric use depending on how water is heated. High efficiency fixtures are at least 20% more efficient than available standard products. Leaking or damaged equipment is a substantial source of water waste. Train users to report continuously dripping, leaking, or otherwise improperly operating equipment to the appropriate personnel. Depending on the age of the equipment and the frequency of use, it may be cost effective to replace older fixtures with current generation WaterSense labeled equipment.

Faucets are used for a variety of purposes, and standard flow rates are dictated by the intended use. Public use lavatory faucets and kitchen faucets are subject to maximum flow rates while service sinks are not. Periodically inspect faucet aerators for scale buildup to ensure flow is not being restricted. Clean or replace the aerator or other spout end device as needed. Check and adjust automatic sensors (where installed) to ensure they are operating properly to avoid faucets running longer than necessary. Post materials in restrooms and kitchens to ensure user awareness of the facility's water-efficiency goals. Remind users to turn off the tap when they are done and to consider turning the tap off during sanitation activities when it is not being used. Consider installing lavatory and kitchen faucet fixtures with reduced flow. Federal standards limit kitchen and restroom faucet flows to 2.2 gpm. To qualify for a WaterSense label a faucet cannot exceed 1.5 gpm.

Effective in 1992, the maximum allowable flow rate for all showerheads sold in the United States is 2.5 gpm. Since this standard was enacted, many showerheads have been designed to use even less water. WaterSense labeled equipment is designed to use 2.0 gpm, or less. For optimum showerhead efficiency, the system pressure should be tested to make sure that it is between 20 and 80 pounds per square inch (psi). Verify that plumbing lines are routed through a shower valve to prevent water pressure fluctuations. Periodically inspect showerheads for scale buildup to ensure flow is not being restricted. In general, replace showerheads with 2.5 gpm flow rates or higher with WaterSense labeled models. Note: Use of poor performing replacement reduced flow showerheads may result in increased use if the duration of use is increased to compensate for reduced performance. WaterSense labeled showerheads are independently certified to meet or exceed minimum performance requirements for spray coverage and force.

Ice Machines

Commercial ice machines use refrigeration units to freeze water into ice. Ice machines typically use water for two purposes: cooling the refrigeration unit and making ice. Because the ice-making process generates a significant amount of heat, either water or air is used to remove this waste heat from the ice machine's refrigeration unit.

Water-cooled ice machines generally pass water through the machine once to cool it and then dispose of the single-pass water down the drain. Water-cooled systems can use less water by recirculating the cooling water through a chiller or a cooling tower to lower the temperature, returning the water to the machine for reuse. To eliminate using water to cool the refrigeration unit altogether, air can be used to cool the unit. Air-cooled ice machines use motor-driven fans or centrifugal blowers to move air through the refrigeration unit to remove heat. In general, water-cooled units are more energy efficient than air-cooled units but use more water. Commercial ice machines that are ENERGY STAR qualified are, on average, 15% more energy-efficient and 10% more water-efficient than standard air-cooled models.

For optimal ice machine efficiency, consider the following:

- Clean the ice machine to remove lime and scale buildup; sanitize it to kill bacteria and fungi. Run the self-cleaning sequence if available. For machines without a self-cleaning mode, shut down the machine, empty the bin of ice, add cleaning or sanitizing solution to the machine, switch it to cleaning mode, and then switch it to ice production mode. For health and safety purposes, create and discard several batches of ice to remove residual cleaning solution.
- Keep the ice machine's coils clean to ensure the heat exchange process is running efficiently.
- Keep the lid closed to preserve cool air and maintain the appropriate temperature.
- Install a timer to shift ice production to off-peak hours to decrease peak energy demand.
- Work with the manufacturer to ensure that the ice machine's rinse cycle is set to the lowest possible frequency that still provides sufficient ice quality and meets local water quality and site requirements.
- Follow the manufacturer's use and care instructions for the specific ice machine model.
- Train users to report leaking or otherwise improperly operating ice machines to the appropriate personnel.

If the machine is cooled using single-pass water, modify the machine to operate on a closed loop that recirculates the cooling water through a cooling tower or heat exchanger, if possible.

When replacing an ice machine or installing a new one, ensure that the new model is sized appropriately to fit the facility's need. Choose an ice machine that is appropriate for the quality of ice needed. Producing ice of higher quality than required will use water unnecessarily. Look for ENERGY STAR qualified models, all of which are air-cooled. Also consider air- or water-cooled ice machines that meet the efficiency specifications outlined by the Consortium for Energy Efficiency. If feasible, consider selecting air-cooled flake or nugget ice machines, which use less water and energy than cubed ice machines.

7 On-Site Generation

You don't have to look far in New Jersey to see one of the thousands of solar electric systems providing clean power to homes, businesses, schools, and government buildings. On-site generation includes both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) technologies that generate power to meet all or a portion of the facility's electric energy needs. Also referred to as distributed generation, these systems contribute to greenhouse gas (GHG) emission reductions, demand reductions, and reduced customer electricity purchases, which results in improved electric grid reliability through better use of transmission and distribution systems.

Preliminary screenings were performed to determine if an on-site generation measure could be a cost-effective solution for your facility. Before deciding to install an on-site generation system, we recommend conducting a feasibility study to analyze existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

7.1 Solar Photovoltaic

Photovoltaic (PV) panels convert sunlight into electricity. Individual panels are combined into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is then connected to the building's electrical distribution system.

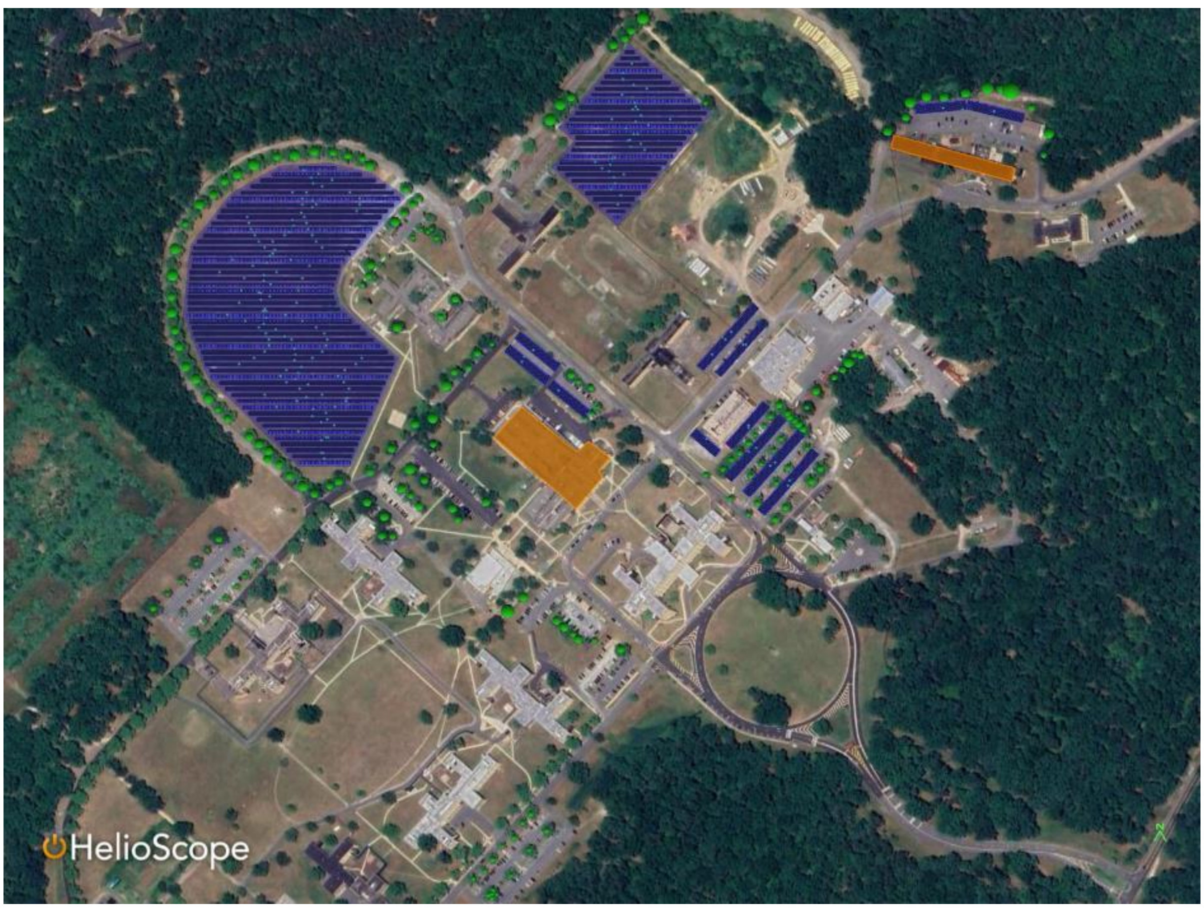
An additional study for solar photovoltaic for the Ancora Psychiatric Hospital is provided below.

Executive Summary

This section summarizes projected energy and cost impacts, as well as design considerations, for a proposed 6.95 MW-DC carport and ground mount solar photovoltaic (PV) system for the Ancora Psychiatric Hospital site located at 301 Spring Garden Rd, Hammonton, NJ 08037. Please note this is a feasibility stage memo, and all cost/savings values are solely estimates and not for design level application.

Here are the system details:

- 6.95 MW carport and ground mount and Solar PV System: The carport and ground mount solar panels are strategically positioned to make the most efficient use of the open area and parking spaces, maximizing coverage of the solar energy generation. The projected solar PV system is expected to generate a total energy output of 9,387,000 kWh, accounting for 100% of the site's total electricity consumption for the year 2022-2023.



Solar PV Layout Figure – HelioScope Design

Site Assessment for PV Installation

During the facility interview process, TRC evaluated the following areas for potential ground-mount solar installations:

- Approximately 10.5 acres of U-shaped open field near Pine Drive North, adjacent to the Maple Building.
- Approximately 3 acres at the Ballfield near Pine Drive East.

Additionally, the following parking lots were assessed for potential carport solar installations:

- In front of the Maintenance Building
- Behind the Food Service Building
- Behind Hickory/Veterans Hall
- In front of the Willow Hall

The carport solar systems at Hickory Hall and Veterans Hall can be interconnected with the meter located at these buildings. All other proposed PV systems should be connected to the main meter located at the Powerhouse.

Note – The parking lot across from Cedar Hall was not considered for PV installation due to its distance from the main meter. Additionally, the proposed PV systems at the other locations are sufficient to meet the facility's total energy consumption needs.

Equipment	Estimated Max Demand Savings (kW)	Estimated Annual Energy Generation (kWh)	Estimated Annual GHG Reduction (MT-CO_2e)	Estimated Annual Cost Savings ($)	Estimated Gross Project Cost ($)	Total Incentives ($)	Net Project Cost ($)	Simple Payback Period[12] (yr.)
6.95 MW Solar PV	352	9,387,087	1,868	$736,002	$42,226,000	$23,224,300	$19,001,700	25.8

Project Summary Table

Rebates and Incentives

Equipment	Estimated Gross Project Cost ($)	ITC Rebate (1)	MACRS Rebate (2)	Net Project Cost
6.95 MW Solar PV	$42,226,000	$12,667,800	$10,556,500	$19,001,700

Incentive Summary Table

[12] Simple payback is computed as the "Net Project Cost" divided by the "Estimated Annual Cost Savings".

Multiple incentives are available to reduce the project cost.

1. Federal Income Tax Credit (ITC): As of the passage of the 2022 Inflation Reduction Act, the ITC refund can be claimed by non-taxable entities as a cash rebate. The ITC is equal to 30% of the system cost and is scheduled to persist until 2033.

2. Modified Accelerated Cost Recovery System (MACRS): As of the passage of the 2022 Inflation Reduction Act, the MACRS refund can be claimed by non-taxable entities as a cash rebate. This rebate allows 85% of the system cost to be claimed as equipment depreciation at Year 1, approximately equivalent to 25% of the system cost.

Ownership Models

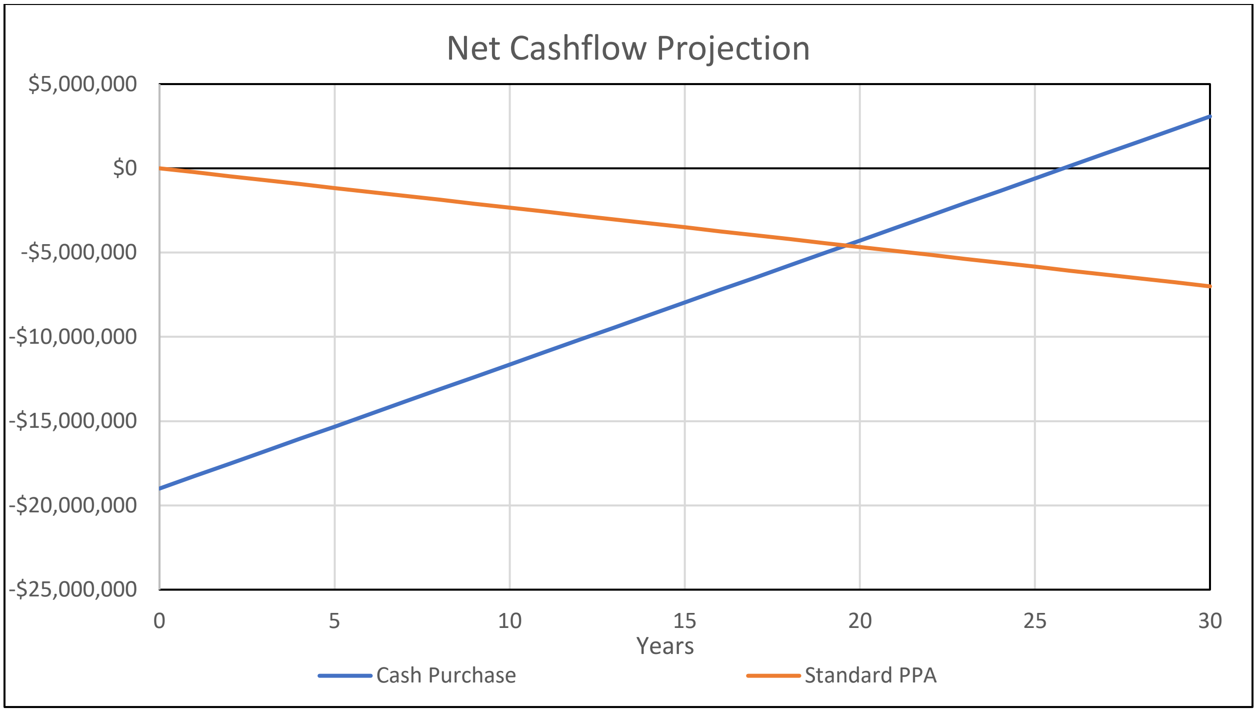
This report explores two ownership models: Cash Purchase and Power Purchase Agreement (PPA).

- Cash Purchase: In this case, the entire system is purchased upfront by the customer.
- Standard Power Purchase Agreement: In this scenario, a third party installs and owns the system, and sells electricity to the customer at a reduced rate. Calculations assume the owner charges a 3% interest rate on the system. In the table below, the interest rate is factored in as an offset to the "Annual Savings ($)". Return on Investment (ROI) is null because there is no cost to the customer.

Ownership Plan	Upfront Gross Project Cost ($)	Year 1 Cost After Rebates ($)	Annual Savings ($)	Lifetime 30-Year Cost Savings ($)	30-Year ROI
Cash Purchase	$42,226,000	$19,001,700	$736,002	$22,080,066	116%
PPA	$0	$0	($233,450)	($7,003,514)	-

Ownership Model Table

Analysis clearly shows that opting for a cash purchase is more advantageous than choosing a Power Purchase Agreement (PPA). This conclusion is based on the consideration of existing available incentives (i.e., ITC & MACRS).



Ownership Model Life Cycle Comparison

PV System Sizing

TRC modeled the proposed solar PV system using HelioScope, a meteorologically and location-dependent solar resource, to estimate its available size and component quantities. The software accounts for building shading, tree shading, tilt angles, and appropriate spacing. The PV system is sized to achieve Net Zero Energy. Note that although the system is sized to produce the total amount consumed by the site on an annual basis, there will be periods where production will lag behind building electrical consumption needs and the site will be grid dependent at those times.

Energy Generation and Management

A HelioScope model was developed to establish approximate PV system sizing. The output was entered into Energy Toolbase® (ETB), a utility cost analysis tool that compares the generation profile vs the building's monthly consumption data. Because the site's energy generation rate structure and energy delivery rate structure are provided by different firms, ETB's estimate of baseline utility cost varied from available billing data by 8%, potentially due to rate schedule changes. ETB outputs were supplemented with worksheet calculations to true up the difference.

Cost savings were finalized by applying an 0.5% annual maintenance cost penalty to the solar PV system; the "Estimated Annual Cost Savings" in the Project Summary Table offsets the utility savings accordingly. The ETB analysis was used to simulate PV operation throughout the year and to calculate utility cost savings with hourly utility rate sensitivity.

Project Cost

Project cost estimates were calculated using RS Means 2022 Construction Cost Catalogue, along with vendor quotes and guidelines available from the modeling software. Construction costs have been escalated by 10% to account for inflation. Costs include contingencies and markups for all potential project tasks, including design, permitting, taxes, and a 30% contingency for infrastructure upgrades. A line-by-line breakdown of the costs considered is provided in Appendix C.

At a high level, average system costs are $6.08/Watt solar PV, based on the gross project cost. Please note that while detailed, cost estimates are still at the feasibility stage. Costs may vary by 30% relative to engineering assessments of the electrical and structural infrastructure.

Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects. Solar projects may qualify to earn SREC- IIs (Solar Renewable Energy Certificates-II), however, the project owners *must* register their solar projects prior to the start of construction to establish the project's eligibility.

Get more information about solar power in New Jersey or find a qualified solar installer who can help you decide if solar is right for your building:

Successor Solar Incentive Program (SuSI): https://www.njcleanenergy.com/renewable-energy/programs/susi-program

- **Basic Info on Solar PV in NJ**: https://www.njcleanenergy.com/renewable-energy/whysolar
- **NJ Solar Market FAQs**: www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs.
- **Approved Solar Installers in the NJ Market**: www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

7.2 Combined Heat and Power

Combined heat and power (CHP) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

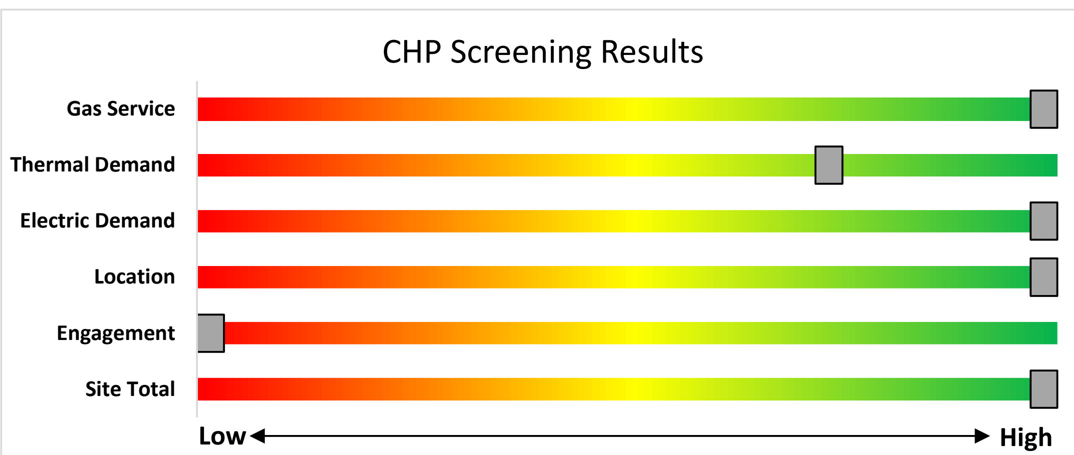
CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for space cooling.

The key criteria used for screening is the amount of time that the CHP system would operate at full load and the facility's ability to use the recovered heat. Facilities with a continuous need for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has high potential for installing a cost-effective CHP system.

The magnitude, type, and duration of the thermal demand, the coincident electric load, and the ease of interconnection contribute to the potential for CHP at the site. Based on the amount of steam used throughout the year and the concurrent electric demand a gas turbine may be feasible. If you are interested in pursuing CHP, we recommend performing a detailed feasibility study, which will provide a thorough understanding of the costs and savings associated with this technology.

The graphic below displays the results of the CHP potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.



Potential	High	
System Type	Gas Turbine	
System Potential	1,600	kW
Electric Generation	13,025,132	kWh/yr
Thermal Generation	101,143,576	MBtu/yr
Displaced Cost	$1,288,931	/yr
Installed Cost	$5,574,000	

Combined Heat and Power Screening

Find a qualified firm that specializes in commercial CHP cost assessment and installation: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

8 Electric Vehicles

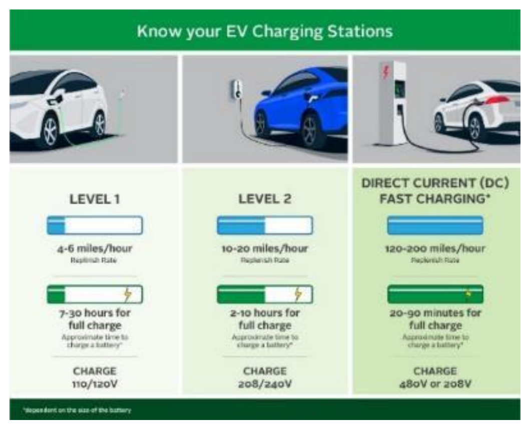
All electric vehicles (EVs) have an electric motor instead of an internal combustion engine. EVs function by plugging into a charge point, taking electricity from the grid, and then storing it in rechargeable batteries. Although electricity production may contribute to air pollution, the U.S. EPA categorizes all-electric vehicles as zero-emission vehicles because they produce no direct exhaust or tailpipe emissions.

EVs are typically more expensive than similar conventional and hybrid vehicles, although some cost can be recovered through fuel savings, federal tax credit, or state incentives

8.1 EV Charging

EV charging stations provide a means for electric vehicle operators to recharge their batteries at a facility. While many EV drivers charge at home, others do not have access to regular home charging, and the ability to charge at work or in public locations is critical to making EVs practical for more drivers. Charging can also be used for electric fleet vehicles, which can reduce fuel and maintenance costs for fleets that replace gas or diesel vehicles with EVs.

EV charging comes in three main types. For this assessment, the screening considers addition of Level 2 charging, which is most common at workplaces and other public locations. Depending on the site type and usage, other levels of charging power may be more appropriate.



The preliminary assessment of EV charging at the facility shows that there is medium potential for adding EV chargers to the facility's parking, based on potential costs of installation and other site factors.

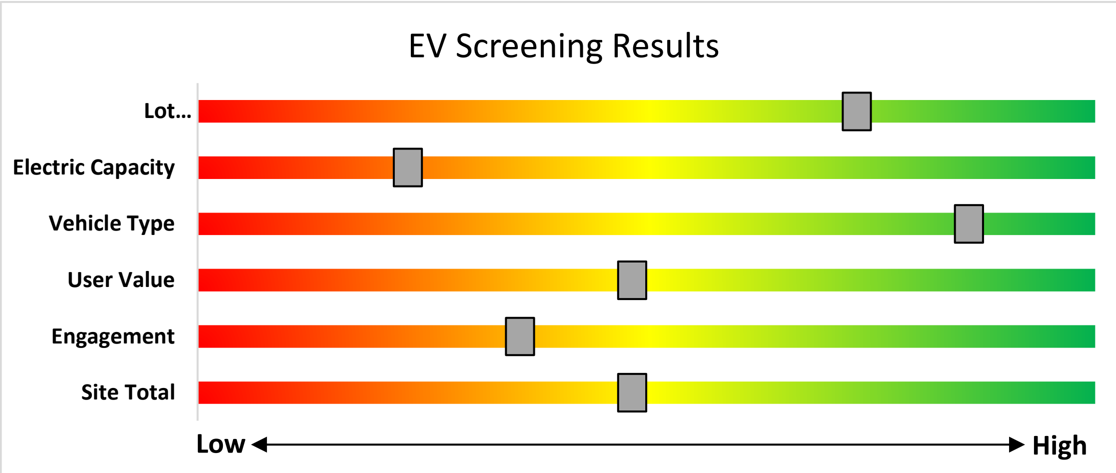
The primary costs associated with installing EV charging are the charger hardware and the cost to extend power from the facility to parking spaces. This may include upgrades to electric panels to serve increased loads.

The type and size of the parking area impact the costs and feasibility of adding EV charging. Parking structure installations can be less costly than surface lot installations as power may be readily available, and equipment and wiring can be surface mounted. Parking lot installations often require trenching through concrete or asphalt surface. Large parking areas provide greater flexibility in charger siting than smaller lots.

The location and capacity of facility electric panels also impact charger installation costs. A Level 2 charger generally requires a dedicated 208V-240V, 40 Amp circuit. The electric panel nearest the planned installation may not have available capacity and may need to be upgraded to serve new EV charging loads. Alternatively, chargers could be powered from a more distant panel. The distance from the panel to the location of charging stations ties directly to costs, as conduits, cables, and potential trenching costs all increase on a per-foot basis. The more charging stations planned, the more likely it is that additional electrical capacity will be needed.

Other factors to consider when planning for EV charging at a facility include who the intended users are, how long they park vehicles at the site, and whether they will need to pay for the electricity they use.

The graphic below displays the results of the EV charging assessment conducted as part of this audit. The position of each slider indicates the impact each factor has on the feasibility of installing EV charging at the site.



EV Charger Screening

Electric Vehicle Programs Available

New Jersey is leading the way on electric vehicle (EV) adoption on the East Coast. There are several programs designed to encourage EV adoption in New Jersey, which is crucial to reaching a 100% clean energy future.

NJCEP offers a variety of EV programs for vehicles, charging stations, and fleets. Certain EV charging stations that receive electric utility service from Atlantic City Electric Company (ACE), Public Service Electric and Gas Company (PSE&G) or Jersey Central Power and Light (JCP&L), may be eligible for additional electric vehicle charging incentives directly from the utility. Projects may be eligible for both the incentives offered by this BPU program and incentives offered by ACE, PSE&G or JCP&L, up to 90% of the combined charger purchase and installation costs. Please check ACE, PSE&G or JCP&L program eligibility requirements before purchasing EV charging equipment, as additional conditions on types of eligible chargers may apply for utility incentives.

EV Charging incentive information is available from Atlantic City Electric, PSE&G and JCP&L. For more information and to keep up to date on all EV programs please visit https://www.njcleanenergy.com/commercial-industrial/programs/electric-vehicle-programs

9 Project Funding and Incentives

Ready to improve your building's performance? New Jersey's Clean Energy Programs and Utility Energy Efficiency Programs can help. Pick the program that works best for you. This section provides an overview of currently available incentive programs in New Jersey.

NJBPU and NJCEP Administered Programs

New Jersey's cleanenergy program™

- New Construction (residential, commercial, industrial, government)
- Large Energy Users
- Energy Savings Improvement Program (financing)
- State Facilities Initiative*
- Local Government Energy Audits
- Combined Heat & Power & Fuel Cells

*State facilities are also eligible for utility programs

Utility Administered Programs

atlantic city electric — AN EXELON COMPANY; Jersey Central Power & Light — A FirstEnergy Company; PSEG; Rockland Electric Company; Elizabethtown Gas; South Jersey Gas; New Jersey Natural Gas

- Existing buildings (residential, commercial, industrial, government)
- Efficient Products
  - Lighting & Marketplace
  - HVAC
  - Appliance Rebates
  - Appliance Recycling

9.1 New Jersey's Clean Energy Program

Save money while saving the planet! New Jersey's Clean Energy Program is a statewide program that offers incentives, programs, and services that benefit New Jersey residents, businesses, educational, non-profit, and government entities to help them save energy, money, and the environment.

Large Energy Users

The Large Energy Users Program (LEUP) is designed to foster self-directed investment in energy projects. This program is offered to New Jersey's largest energy customers. To qualify entities must have incurred at least $5 million in total energy costs in the prior fiscal year.

Incentives

Incentives are based on the specifications below. The maximum incentive per entity is the lesser of:

- $4 million
- 75% of the total project(s) cost
- 90% of total NJCEP fund contribution in previous year
- $0.33 per projected kWh saved; $3.75 per projected Therm saved annually

How to Participate

To participate in LEUP, you will first need submit an enrollment application. This program requires all qualified and approved applicants to submit an energy plan that outlines the proposed energy efficiency work for review and approval. Applicants may submit a Draft Energy Efficiency Plan (DEEP), or a Final Energy Efficiency Plan (FEEP). Once the FEEP is approved, the proposed work can begin.

Detailed program descriptions, instructions for applying, and applications can be found at http://www.njcleanenergy.com/LEUP.

Combined Heat and Power

The Combined Heat & Power (CHP) program provides incentives for eligible CHP or waste heat to power (WHP) projects. Eligible CHP or WHP projects must achieve an annual system efficiency of at least 65% (lower heating value, or LHV), based on total energy input and total utilized energy output. Mechanical energy may be included in the efficiency evaluation. ≤

Incentives[13]

Eligible Technology	Size (Installed Rated Capacity)	Incentive ($/Watt)[5]	% of Total Cost Cap per Project	$ Cap per Project
CHPs powered by non-renewable or renewable fuel source, or a combination:[4] - Gas Internal Combustion Engine - Gas Combustion Turbine - Microturbine	≤500 kW[1]	$2.00	30-40%[2]	$2 million
	>500 kW - 1 MW[1]	$1.00		
	> 1 MW - 3 MW[1]	$0.55	30%	$3 million
Fuel Cells ≥60%	>3 MW[1]	$0.35		
Fuel Cells ≥40%	Same as above[1]	Applicable amount above	30%	$1 million
Waste Heat to Power (WHP)[3] Powered by non-renewable fuel source. Heat recovery or other mechanical recovery from existing equipment utilizing new electric generation equipment (e.g. steam turbine)	≤1MW[1]	$1.00	30%	$2 million
	> 1MW[1]	$.50	30%	$3 million

13

[1] Incentives are tiered, which means the incentive levels vary based upon the installed rated capacity, as listed in the chart above. For example, a 4 MW CHP system would receive $2.00/watt for the first 500 kW, $1.00/watt for the second 500 kW, $0.55/watt for the next 2 MW and $0.35/watt for the last 1 MW (up to the caps listed).

[2] The maximum incentive will be limited to 30% of total project. For CHP projects up to 1 MW, this cap will be increased to 40% where a cooling application is used or included with the CHP system (e.g. absorption chiller).

[3] Projects will be eligible for incentives shown above, not to exceed the lesser of % of total project cost per project cap or maximum $ per project cap. Projects installing CHP or FC with WHP will be eligible for incentive shown above, not to exceed the lesser caps of the CHP or FC incentive. Minimum efficiency will be calculated based on annual total electricity generated, utilized waste heat at the host site (i.e. not lost/rejected), and energy input.

[4] Systems fueled by a Class 1 Renewable Fuel Source, as defined by N.J.A.C. 14:8-2.5, are eligible for a 30% incentive bonus. If the fuel is mixed, the bonus will be prorated accordingly. For example, if the mix is 60/40 (60% being a Class 1 renewable), the bonus will be 18%. This bonus will be included in the final performance incentive payment, based on system performance and fuel mix consumption data. Total incentive, inclusive of bonus, shall not exceed above stipulated caps.

[5] CHP-FC systems located at Critical Facility and incorporating blackstart and islanding technology are eligible for a 25% incentive bonus. This bonus incentive will be paid with the second/Installation incentive payment. Total incentive, inclusive of bonus, shall not exceed above stipulated caps.

How to Participate

You will work with a qualified developer or consulting firm to complete the CHP application. Once the application is approved the project can be installed. Information about the CHP program can be found at http://www.njcleanenergy.com/CHP.

Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects must register their projects prior to the start of construction to establish the project's eligibility to earn SREC-IIs (Solar Renewable Energy Certificates-II). SuSI consists of two sub-programs. The Administratively Determined Incentive (ADI) Program and the Competitive Solar Incentive (CSI) Program.

Administratively Determined Incentive (ADI) Program

The ADI Program provides administratively set incentives for net metered residential projects, net metered non-residential projects 5 MW or less, and all community solar projects.

After the registration is accepted, construction is complete, and a complete final as-built packet has been submitted, the project is issued a New Jersey certification number, which enables it to generate New Jersey SREC- IIs.

Market Segments	Size MW dc	Incentive Value ($/SREC II)	Public Entities Incentive Value - $20 Adder ($/SRECII)
Net Metered Residential	All types and sizes	$90	N/A
Small Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects smaller than 1 MW	$100	$120
Large Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects 1 MW to 5 MW	$90	$110
Small Net Metered Non-Residential Ground Mount	Projects smaller than 1 MW	$85	$105
Large Net Metered Non-Residential Ground Mount	Projects 1 MW to 5 MW	$80	$100
LMI Community Solar	Up to 5 MW	$90	N/A
Non-LMI Community Solar	Up to 5 MW	$70	N/A
Interim Subsection (t)	All types and sizes	$100	N/A

Eligible projects may generate SREC-IIs for 15 years following the commencement of commercial operations which is defined as permission to operate (PTO) from the Electric Distribution Company. After 15 years, projects may be eligible for a NJ Class I REC.

SREC-IIs will be purchased monthly by the SREC-II Program Administrator who will allocate the SREC-IIs to the Load Serving Entities (BGS Providers and Third-Party Suppliers) annually based on their market share of retail electricity sold during the relevant Energy Year.

The ADI Program online portal is now open to new registrations.

Competitive Solar Incentive (CSI) Program

The CSI Program opened on April 15, 2023, and will serve as the permanent program within the SuSI Program providing incentives to larger solar facilities. The CSI Program is open to qualifying grid supply solar facilities, non-residential net metered solar installations with a capacity greater than five (5) megawatts ("MW"), and to eligible grid supply solar facilities installed in combination with energy storage.

CSI eligible facilities will only be allowed to register in the CSI program upon award of a bid pursuant to N.J.A.C. 14:8-11.10.

The CSI program structure has separate categories, or tranches, to ensure that a range of solar project types, including those on preferred sites, are able to participate despite potentially different project cost profiles. The Board has approved four tranches for grid supply and large net metered solar and an additional fifth tranche for storage in combination with grid supply solar. The following table lists procurement targets for the first solicitation:

Tranche	Project Type	MW (dc) Targets
Tranche 1.	Basic Grid Supply	140
Tranche 2.	Grid Supply on the Built Environment	80
Tranche 3.	Grid Supply on Contaminated Sites and Landfills	40
Tranche 4.	Net Metered Non- Residential	40
Tranche 5.	*Storage Paired with Grid	160 MWh

*The storage tranche of 160 MWh corresponds to a 4-hour storage pairing of 40 MW of solar

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan.

If you are considering installing solar on your building, visit the following link for more information: https://njcleanenergy.com/renewable-energy/programs/susi-program

Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. An ESIP is a type of performance contract, whereby school districts, counties, municipalities, housing authorities, and other public and state entities enter contracts to help finance building energy upgrades. Annual payments are lower than the savings projected from the energy conservation measures (ECMs), ensuring that ESIP projects are cash flow positive for the life of the contract.

ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs described above can also be used to help further reduce the total project cost of eligible measures.

How to Participate

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an energy services company or "ESCO."
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
(3) Use a hybrid approach of the two options described above where the ESCO is used for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the energy savings plan can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program descriptions and application can be found at www.njcleanenergy.com/ESIP.

ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you can use NJCEP incentive programs to help further reduce costs when developing the energy savings plan. Refer to the ESIP guidelines at the link above for further information and guidance on next steps.

Demand Response (DR) Energy Aggregator

Demand Response Energy Aggregator is a program designed to reduce the electric load when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Grid operators call upon curtailment service providers and commercial facilities to reduce electric usage during times of peak demand, making the grid more reliable and reducing transmission costs for all ratepayers. Curtailment service providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary, and participants receive payments whether or not their facility is called upon to curtail its electric usage.

Typically, an electric customer must be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with greater capability to quickly curtail their demand during peak hours receive higher payments. Customers with back-up generators on site may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in DR programs often find it to be a valuable source of revenue for their facility, because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature setpoints on thermostats (so that air conditioning units run less frequently) or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a DR activity in most situations.

The first step toward participation in a DR program is to contact a curtailment service provider. A list of these providers is available on the website of the independent system operator, PJM, and it includes contact information for each company, as well as the states where they have active business[14]. PJM also posts training materials for program members interested in specific rules and requirements regarding DR activity along with a variety of other DR program information[15].

Curtailment service providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities, and they may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

[14] http://www.pjm.com/markets-and-operations/demand-response.aspx.

[15] http://www.pjm.com/training/training-events.aspx.

9.2 Utility Energy Efficiency Programs

The Clean Energy Act, signed into law by Governor Murphy in 2018, requires New Jersey's investor-owned gas and electric utilities to reduce their customers' use by set percentages over time. To help reach these targets the New Jersey Board of Public Utilities approved a comprehensive suite of energy efficiency programs to be run by the utility companies.

Prescriptive and Custom

The Prescriptive and Custom rebate program through your utility provider offers incentives for installing prescriptive and custom energy efficiency measures at your facility. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades. This program serves most common equipment types and sizes.

Equipment Examples

Lighting
Lighting Controls
HVAC Equipment
Refrigeration
Gas Heating
Gas Cooling
Commercial Kitchen Equipment
Food Service Equipment
Variable Frequency Drives
Electronically Commutate Motors
Variable Frequency Drives
Plug Loads Controls
Washers and Dryers
Agricultural
Water Heating

The Prescriptive program provides fixed incentives for specific energy efficiency measures. Prescriptive incentives vary by equipment type. The Custom program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentives.

Direct Install

Direct Install is a turnkey program available to existing small to medium-sized facilities with an average peak electric demand that does not exceed 200 kW or less over the recent 12-month period. You work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives, and controls.

Incentives

The program pays up to 70% of the total installed cost of eligible measures.

How to Participate

To participate in Direct Install, you will work with a participating contractor. The contractor will be paid the measure incentives directly by the program, which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the Direct Install program, subject to program rules and eligibility, while the remaining percent of the cost is paid to the contractor by the customer.

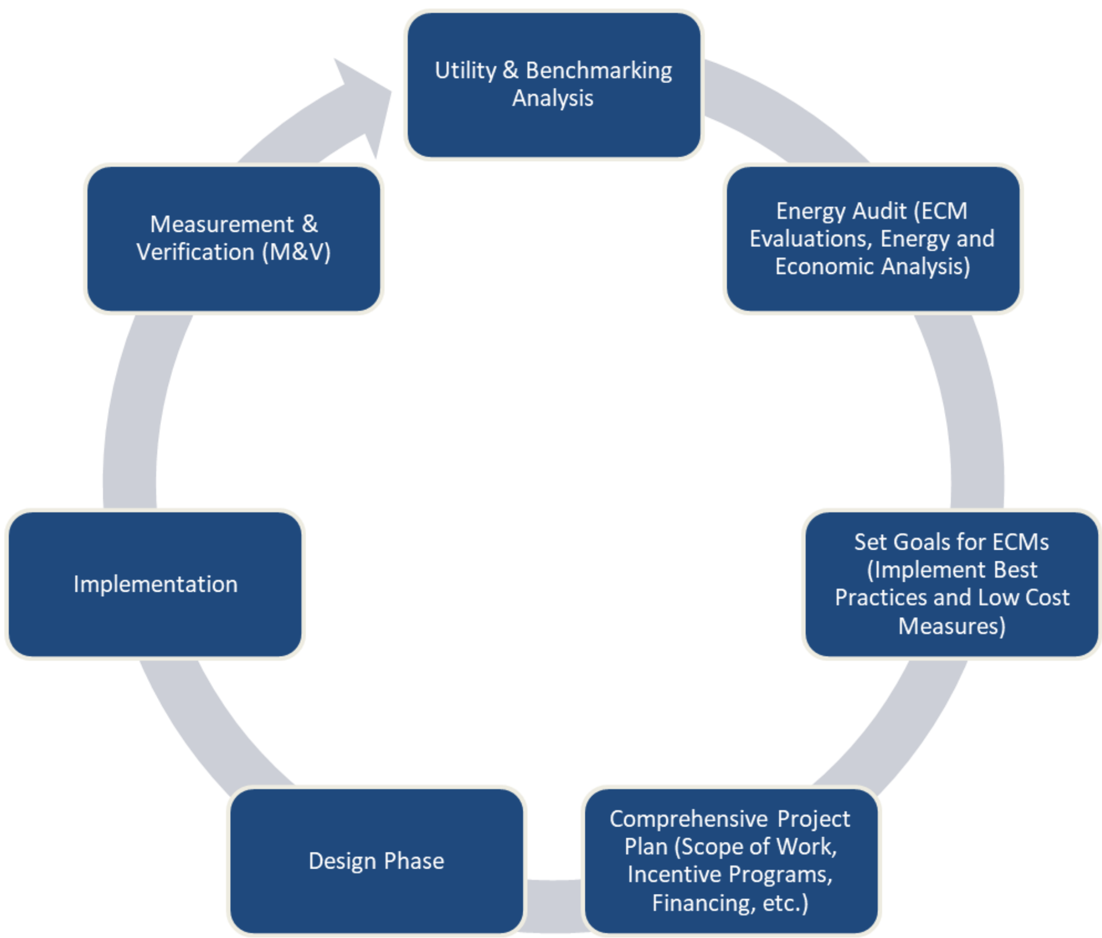
Engineered Solutions

The Engineered Solutions Program provides tailored energy-efficiency assistance and services to municipalities, universities, schools, hospitals, and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. Customers receive expert guided services, including investment-grade energy auditing, engineering design, installation assistance, construction administration, commissioning, and measurement and verification (M&V) services to support the implementation of cost-effective and comprehensive efficiency projects. Engineered Solutions is generally a good option for medium to large sized facilities with a peak demand over 200 kW looking to implement as many measures as possible under a single project to achieve deep energy savings. Engineered Solutions has an added benefit of addressing measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program loan also use this program. Incentives for this program are based on project scope and energy savings achieved.

For more information on any of these programs, contact your local utility provider or visit https://www.njcleanenergy.com/transition.

10 Project Development

Energy conservation measures (ECMs) have been identified for your site, and their energy and economic analyses are provided within this LGEA report. Note that some of the identified projects may be mutually exclusive, such as replacing equipment versus upgrading motors or controls. The next steps with project development are to set goals and create a comprehensive project plan. The graphic below provides an overview of the process flow for a typical energy efficiency or renewable energy project. We recommend implementing as many ECMs as possible prior to undertaking a feasibility study for a renewable project. The cyclical nature of this process flow demonstrates the ongoing work required to continually improve building energy efficiency over time. If your building(s) scope of work is relatively simple to implement or small in scope, the measurement and verification (M&V) step may not be required. It should be noted through a typical project cycle, there will be changes in costs based on specific scopes of work, contractor selections, design considerations, construction, etc. The estimated costs provided throughout this LGEA report demonstrate the unburdened turn-key material and labor cost only. There will be contingencies and additional costs at the time of implementation. We recommend comprehensive project planning that includes the review of multiple bids for project work, incorporates potential operations and maintenance (O&M) cost savings, and maximizes your incentive potential.



Project Development Cycle

11 Energy Purchasing and Procurement Strategies

11.1 Retail Electric Supply Options

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. Though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third-party supplier, consider shopping for a reduced rate from third-party electric suppliers. If your facility already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party electric suppliers is available at the NJBPU website[16].

11.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market based and fluctuate monthly. The utility provides basic gas supply service to customers who choose not to buy from a third-party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier typically depends on whether a customer prefers budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third-party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party natural gas suppliers is available at the NJBPU website[17].

[16] www.state.nj.us/bpu/commercial/shopping.html

[17] www.state.nj.us/bpu/commercial/shopping.html

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Corridor - Office	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch	S	12	8,736		None	No	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch	12	8,736	0.0	0	0	$0	$0	$0	0.0
Electrical Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,160	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,160	0.0	233	0	$34	$90	$20	2.0
Janitorial Closet	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch	S	12	1,820		None	No	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch	12	1,820	0.0	0	0	$0	$0	$0	0.0
Locker Room	1	Incandescent: (1) 75W A19 Screw-In Lamp	Wall Switch	S	75	6,552	3, 4	Relamp	Yes	1	LED Lamps: A19 Lamps	Occupancy Sensor	12	4,521	0.0	437	0	$64	$30	$0	0.5
Locker Room	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,552	4	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,521	0.0	118	0	$17	$330	$40	16.7
Mechanical - Battery Room	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	8,736	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	515	0	$76	$90	$10	1.1
Mechanical - Boilers	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Mechanical - Boilers	13	LED Lamps: (1) 50W Corn Bulb Screw-In Lamp	Wall Switch	S	50	8,736	4	None	Yes	13	LED Lamps: (1) 50W Corn Bulb Screw-In Lamp	Occupancy Sensor	50	6,028	0.1	1,760	0	$259	$330	$40	1.1
Mechanical - Boilers	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	8,736	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.2	2,201	-1	$324	$630	$100	1.6
Mechanical - Generators	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch	S	12	8,736	4	None	Yes	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Occupancy Sensor	12	6,028	0.0	32	0	$5	$0	$0	0.0
Mechanical - Generators	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	4	None	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.0	550	0	$81	$330	$40	3.6
Office - Boiler Operator	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,280	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	7,280	0.0	240	0	$35	$50	$10	1.1
Office - Supervisor	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,280	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,023	0.1	917	0	$135	$480	$70	3.0
Office - Supervisor	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	7,280	3, 4	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	5,023	0.0	539	0	$79	$90	$20	0.9
Storage - Roof Access	4	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch	S	12	7,280		None	No	4	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch	12	7,280	0.0	0	0	$0	$0	$0	0.0
Exterior	1	High-Pressure Sodium: (1) 250W Lamp	Photocell		295	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Architectural Flood/Spot Luminaire	Photocell	75	4,380	0.0	964	0	$144	$660	$50	4.2
Exterior	1	High-Pressure Sodium: (1) 70W Lamp	Photocell		95	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Architectural Flood/Spot Luminaire	Photocell	21	4,380	0.0	324	0	$49	$660	$50	12.6
Exterior	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch		12	4,380		None	No	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch	12	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior	5	LED - Fixtures: Wall Pack	Photocell		20	4,380		None	No	5	LED - Fixtures: Wall Pack	Photocell	20	4,380	0.0	0	0	$0	$0	$0	0.0

Motor Inventory & Recommendations

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	**Area(s)/System(s) Served**	**Motor Quantity**	**Motor Application**	**HP Per Motor**	**Full Load Efficiency**	**VFD Control?**	**Manufacturer**	**Model**	**Remaining Useful Life**	**Annual Operating Hours**	**ECM #**	**Install High Efficiency Motors?**	**Full Load Efficiency**	**Install VFDs?**	**Number of VFDs**	**Total Peak kW Savings**	**Total Annual kWh Savings**	**Total Annual MMBtu Savings**	**Total Annual Energy Cost Savings**	**Estimated M&L Cost ($)**	**Total Incentives**	**Simple Payback w/ Incentives in Years**
Mechanical - Boilers	Boiler Feed Water Pump	3	Boiler Feed Water Pump	40.00	94.1%	No	Baldor	EM2538T-CI	W	1,300		No	94.1%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boilers	Condensate Pump	2	Condensate Pump	5.00	86.5%	No	Baldor	EM32121	W	1,922	5	No	86.5%	Yes	2	1.0	6,214	0	$931	$11,700	$1,800	10.6
Storage - Roof Access	Condensate Pump	2	Condensate Pump	0.33	70.0%	No	Marathon		W	1,922		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Locker Room	Exhaust Fan	1	Exhaust Fan	0.25	65.0%	No	Magnus	Aquafilm V6701	W	1,922		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boilers	Chemical Pumps	1	Process Pump	0.25	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boilers	Process Pump	2	Process Pump	3.00	87.5%	No			W	0		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boilers	Process Pump	2	Process Pump	0.50	75.0%	No			W	1,373		No	75.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boilers	Combustion Air Fans	3	Combustion Air Fan	10.00	91.0%	No			W	800		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0

Packaged HVAC Inventory & Recommendations

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	**Area(s)/System(s) Served**	**System Quantity**	**System Type**	**Cooling Capacity per Unit (Tons)**	**Heating Capacity per Unit (MBh)**	**Cooling Mode Efficiency (SEER/IEER/ EER)**	**Heating Mode Efficiency**	**Manufacturer**	**Model**	**Remaining Useful Life**	**ECM #**	**Install High Efficiency System?**	**System Quantity**	**System Type**	**Cooling Capacity per Unit (Tons)**	**Heating Capacity per Unit (MBh)**	**Cooling Mode Efficiency (SEER/IEER/ EER)**	**Heating Mode Efficiency**	**Total Peak kW Savings**	**Total Annual kWh Savings**	**Total Annual MMBtu Savings**	**Total Annual Energy Cost Savings**	**Estimated M&L Cost ($)**	**Total Incentives**	**Simple Payback w/ Incentives in Years**
Mechanical - Battery Room	Mechanical - Battery Room	1	Window AC	1.26		11.80		Frigidaire		W		No							0.0	0	0	$0	$0	$0	0.0
Office - Boiler Operator	Office - Boiler Operator	1	Window AC	0.42		12.10				W		No							0.0	0	0	$0	$0	$0	0.0
Office - Supervisor	Office - Supervisor	1	Window AC	1.00		11.00				W		No							0.0	0	0	$0	$0	$0	0.0

Space Heating Boiler Inventory & Recommendations

		Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	**Area(s)/System(s) Served**	**System Quantity**	**System Type**	**Output Capacity per Unit (MBh)**	**Manufacturer**	**Model**	**Remaining Useful Life**	**ECM #**	**Install High Efficiency System?**	**System Quantity**	**System Type**	**Output Capacity per Unit (MBh)**	**Heating Efficiency**	**Heating Efficiency Units**	**Total Peak kW Savings**	**Total Annual kWh Savings**	**Total Annual MMBtu Savings**	**Total Annual Energy Cost Savings**	**Estimated M&L Cost ($)**	**Total Incentives**	**Simple Payback w/ Incentives in Years**
Boiler House	Campus Space Heating & DHW Systems	1	Forced Draft Steam Boiler	28,637	Cleaver Brooks	D-52	B	1	Yes	1	Forced Draft Steam Boiler	28,637	81.00%	Et	0.0	0	630	$7,048	$1,064,600	$0	151.0
Boiler House	Campus Space Heating & DHW Systems	2	Forced Draft Steam Boiler	25,523	Cleaver Brooks	WT400XBR-2	B	1	Yes	2	Forced Draft Steam Boiler	25,523	81.00%	Et	0.0	0	1,123	$12,564	$1,882,900	$0	149.9

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Locker Room	Domestic Hot Water System	6	8	0.75	0.0	347	0	$52	$110	$20	1.7

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Locker Room	Domestic Hot Water System	1	Storage Tank Water Heater (≤ 50 Gal)	Rheem	PROE40 M2 RH95	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommendation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Locker Room	7	2	Faucet Aerator (Lavatory)	2.20	0.50	0.0	167	0	$25	$20	$10	0.4
Locker Room	7	1	Showerhead	2.50	1.50	0.0	138	0	$21	$100	$20	3.9

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical - Boilers	1	Ice Making Head (≥450 lbs/day), Batch	Scotsman		No		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Office - Supervisor	2	Coffee Machine	900	No		
Mechanical - Boilers	2	Desktop	150	No		
Office - Boiler Operator	1	Desktop	150	No		
Office - Supervisor	1	Desktop	150	No		
Office - Supervisor	1	Microwave	1,000	No		
Mechanical - Battery Room	1	Battery Charger	2,952	No	Hindle Power	AT10130012F120SX
Mechanical - Boilers	1	Treadmill	700	No		
Office - Boiler Operator	1	Printer (Medium/Small)	200	No		
Office - Supervisor	2	Printer (Medium/Small)	200	No		
Office - Supervisor	1	Refrigerator (Residential)	218	No		
Office - Boiler Operator	1	Television	190	No		
Office - Supervisor	1	Television	190	No		
Mechanical - Battery Room	1	Battery Charger	480	No	Hindle Power	AT10024006E240SX

Custom (High Level) Measure Analysis

Electric Tank Water Heater to HPWH

NOTE: HPWH calculation should not be used for existing water heaters with a storage capacity greater than 120 gal or less than 30 gal.

Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis										
Description	Area(s)/System(s) Served	SF of Area Served	Fuel Type	Input Capacity per Unit (kW)	Tank Capacity per Unit (Gal)	Description	COP	Tank Capacity per Unit (Gal)	Estimated Unit Cost	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Base Incentives	Enhanced Incentives	Total Incentives	Total Net Cost	Payback w/o Incentives in Years	Payback w/ Incentives in Years
Storage Tank Water Heater (≤50 Gal)	Domestic Hot Water System	5,148	Electric	4.5	40	Heat Pump Water Heater	2.5	40	$2,091.00	0.00	2,082	0	$312	$2,500	$0	$0	$0	$2,500	8.01	8.01
			Electric																	
			Electric																	

APPENDIX B: ENERGY STAR STATEMENT OF ENERGY PERFORMANCE

Energy use intensity (EUI) is presented in terms of site energy and source energy. Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

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ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

DHS - Ancora Psychiatric Hospital (APH Campus)

Primary Property Type: Other - Specialty Hospital
Gross Floor Area (ft²): 833,680
Built: 1953

For Year Ending: April 30, 2023
Date Generated: August 05, 2024

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
DHS - Ancora Psychiatric Hospital (APH Campus) 301 Spring Garden Road Hammonton, New Jersey 08037	State of New Jersey 428 East State Street Trenton, NJ 08625 (609) 940-4129	New Jersey Board of Public Utilities State Energy Services 44 South Clinton Ave Trenton, NJ 08625 (609) 633-9666 BPU.EnergyServices@bpu.nj.gov

Property ID: 29865004
Unique Building Identifier (UBID): 87F7M4MQ+39R-448-488-439-512

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
212.3 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	154,445,594 (87%)
Electric - Grid (kBtu)	22,538,831 (13%)

Source EUI
270.2 kBtu/ft²

National Median Comparison

National Median Site EUI (kBtu/ft²)	340.9
National Median Source EUI (kBtu/ft²)	433.9
% Diff from National Median Source EUI	-38%

Annual Emissions

Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	10,229

Signature & Stamp of Verifying Professional

I _________________ (Name) verify that the above information is true and correct to the best of my knowledge.

LP Signature: ______________________Date: ___________

Licensed Professional

____ ________
,
(____)____-______
____

Professional Engineer or Registered Architect Stamp
(if applicable)

Summary

DER	Gross Project Cost ($)	Energy Generation (kWh)	Demand Reduction (kW)	GHG Reduction (MT CO2)	Total Annual Utility Cost Savings ($/yr)	New Maintenance Penalty ($/yr)	Net Annual Cost Savings ($/yr)	Incentives (ITC) ($)	Depreciation (MACRS) ($)	Net Project Cost ($)	Net Simple Payback (yr)
6.95 MW Solar PV	$42,226,000	9,387,087	352	1,868	$947,132	$211,130	$736,002	$12,667,800	$10,556,500	$19,001,700	25.8
Total	$42,226,000	9,387,087	352	1,868	$947,132	$211,130	$736,002	$12,667,800	$10,556,500	$19,001,700	25.8

PPA Alternative:	-$233,450	Annual Utility Savings

Baseline kWh	9,373,054
Saved kWh	9,387,087
% NZE	100%
NZE Solar Size MW	6.94

Equipment	Estimated Max Demand Savings (kW)	Estimated Annual Energy Generation (kWh)	Estimated Annual GHG Reduction ($MT-CO_2e$)	Estimated Annual Cost Savings ($)	Estimated Gross Project Cost ($)	Total Incentives ($)	Net Project Cost ($)	Simple Payback Period (yr)
6.95 MW Solar PV	352	9,387,087	1,868	$736,002	$42,226,000	$23,224,300	$19,001,700	25.8
Total	352	9,387,087	1,868	$736,002	$42,226,000	$23,224,300	$19,001,700	25.8

)wnership Plan	Upfront Cost	Year 1 Cost After Rebates	Annual Savings	Lifetime 30-Year Cost Savings ($)	30-Year ROI
Cash Purchase	$42,226,000	$19,001,700	$736,002	$22,080,066	116%
PPA	$0	$0	($233,450)	($7,003,514)	-

Equipment	Estimated Gross Project Cost ($)	ITC Rebate	MACRS Rebate	Net Project Cost
6.95 MW Solar PV	$42,226,000	$12,667,800	$10,556,500	$19,001,700

Costing

System Description	Quantity	Unit	Equipment Cost per Unit ($)	Labor Cost Per Unit ($)	Material Cost Per Unit ($)	Total Material Cost ($)	Total Equipment Cost ($)	Total Labor Cost ($)	Total Cost ($)	Source	Notes
Solar Array											
PV Modules (Trina Solar 320 W)	6,950,000	Watts DC			$0.45	$3,127,500	$0	$0	$3,127,500	PV size from ETB, cost from NREL report	https://www.nrel.gov/docs/fy22osti/83586.pdf
Inverter, 30 kW	186	Ea.		$400	$4,500	$837,000	$0	$297,898	$1,134,898	Inverter size from Helioscope - Cost from online quote Labor - 4 Hrs. Electrician per unit	https://www.solaris-shop.com/sma-sunny-tripower-x-30-us-50-stp-30-us-50-480vac-afci-dc-disconnect-sunspec-certified-rapid-shutdown-transmitter/
Ground Structure and Racking Cost/Labor/Installation	6,950,000	Watts DC		$1.21	$1.00	$6,950,000	$0	$8,417,145	$15,367,145	Energy ToolBase	Considered PV Mounting/Racking Cost
PV String Combiner Panels	163	Ea.		$100.10	$568	$92,507	$0	$32,583	$125,090	Online Quote Labor - 1 Hrs. Electrician per unit	https://www.solaris-shop.com/sma-cu1000-us-11-string-combiner-w-disconnect/ Each 1000V combiner box with disconnect switch can accommodate 8 strings total Project site has up to 1,302 strings
Electrical BOS Ground Mount & Carport	66,848	m^2	$0	$0	$50.00	$3,342,424	$0	$0	$3,342,424	assumed the same cost as the ground mounted https://www.nrel.gov/docs/fy22osti/83586.pdf	U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022
Carport Linear LED Surface Mount Lighting Fixture	35	Ea.		$100.10	$61.83	$2,160	$0	$3,497	$5,658	RS Means Line #: 26 51 13 44 2010 https://www.1000bulbs.com/product/217486/PLT-90093.html	(1) Electrician to install
Installation rental equipment Ground Mount	66,848	m^2	$14.60	$0	$0	$0	$975,988	$0	$975,988	assumed the same cost as the ground mounted https://www.nrel.gov/docs/fy22osti/83586.pdf	U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022
Trenching/Site Prep and Wiring											
Schedule 80 PVC Piping 6" Diameter	3,500	LF	$0	$45	$53	$185,500	$0	$158,328	$343,828	RS means - 221113742560	
Trenching and Backfill 12" wide, 36" Deep	15	Day.	$425	$1,836.40	$0	$0	$6,375	$27,546	$33,921	Includes B-54 Crew - reference 312316142850	(2) Days of work (2) Laborers (1) 40 HP Chain Trencher (1) Light Equip Operator
Soil Excavation, Removal, loading, and hauling	15	L.C.Y	$ 6.78	$6.15	$0	$0	$102	$92	$194	Includes B-34D Crew - reference 312323204304	Includes (1) Truck Driver (1) Truck Tractor (1) Dump Trailer

System Description	Quantity	Unit	Equipment Cost per Unit ($)	Labor Cost Per Unit ($)	Material Cost Per Unit ($)	Total Material Cost ($)	Total Equipment Cost ($)	Total Labor Cost ($)	Total Cost ($)	Source	Notes
Backfill and Asphalt Paving 8" Thick	15	Day.	$3,428	$6,777.20	$30	$3,213	$51,418	$101,658	$156,289	Includes B-25 Crew - reference 32 11 26 13 0560	1 Day of Filling Trench and Repaving Asphalt Includes (1) Labor Foreman (7) Laborers (3) Equipment Operators (1) Asphalt Paver, 130 H.P. (1) Tandem Roller, 10 Ton (1) Roller, Pneum. Wheel, 12 Ton
Other Costs											
Migrogrid Controller	6,950	kW	$0	$7.63	$155	$1,077,250	$0	$53,005	$1,130,255	https://www.nrel.gov/docs/fy19osti/67821.pdf NREL data base ($155,000/MW)	Inclusive of 1 Electrician @ 8 Hrs. Per Unit
User Training	8	Hr.	$0	$150	$0	$0	$0	$1,200	$1,200		
					Total	$15,617,600	$1,033,900	$9,093,000	$25,744,388		

Markup	Cost
System Cost	$25,744,388
NJ Sales Tax (6.625%)	$1,034,666
O&P Cost (10%)	$2,574,439
EPC Markup (10%)	$2,574,439
Contingency (30%)	$7,723,316
Escalation from 2022	$2,574,439
Total Cost	$42,226,000

Solar Cost	$40,370,185
Electrical Upgrades, Permitting and Misc...	$1,855,815
Solar Cost with Elec Upgrades	$42,226,000

TRC

PPA Analysis

	Income			Net		
Year	Cash Purchase	Standard PPA	PPA with Year 10 Buyout	Cash Purchase	Standard PPA	PPA with Year 10 Buyout
0	-$19,001,700	$0	$0	-$19,001,700	$0	$0
1	$736,002	-$233,450	-$233,450	-$18,265,698	-$233,450	-$233,450
2	$736,002	-$233,450	-$233,450	-$17,529,696	-$466,901	-$466,901
3	$736,002	-$233,450	-$233,450	-$16,793,693	-$700,351	-$700,351
4	$736,002	-$233,450	-$233,450	-$16,057,691	-$933,802	-$933,802
5	$736,002	-$233,450	-$233,450	-$15,321,689	-$1,167,252	-$1,167,252
6	$736,002	-$233,450	-$233,450	-$14,585,687	-$1,400,703	-$1,400,703
7	$736,002	-$233,450	-$233,450	-$13,849,685	-$1,634,153	-$1,634,153
8	$736,002	-$233,450	-$233,450	-$13,113,682	-$1,867,604	-$1,867,604
9	$736,002	-$233,450	-$233,450	-$12,377,680	-$2,101,054	-$2,101,054
10	$736,002	-$233,450	-$233,450	-$11,641,678	-$2,334,505	-$2,334,505
11	$736,002	-$233,450	-$9,967,247	-$10,905,676	-$2,567,955	-$12,301,752
12	$736,002	-$233,450	$736,002	-$10,169,674	-$2,801,405	-$11,565,750
13	$736,002	-$233,450	$736,002	-$9,433,671	-$3,034,856	-$10,829,747
14	$736,002	-$233,450	$736,002	-$8,697,669	-$3,268,306	-$10,093,745
15	$736,002	-$233,450	$736,002	-$7,961,667	-$3,501,757	-$9,357,743
16	$736,002	-$233,450	$736,002	-$7,225,665	-$3,735,207	-$8,621,741
17	$736,002	-$233,450	$736,002	-$6,489,663	-$3,968,658	-$7,885,739
18	$736,002	-$233,450	$736,002	-$5,753,660	-$4,202,108	-$7,149,736
19	$736,002	-$233,450	$736,002	-$5,017,658	-$4,435,559	-$6,413,734
20	$736,002	-$233,450	$736,002	-$4,281,656	-$4,669,009	-$5,677,732
21	$736,002	-$233,450	$736,002	-$3,545,654	-$4,902,460	-$4,941,730
22	$736,002	-$233,450	$736,002	-$2,809,651	-$5,135,910	-$4,205,727
23	$736,002	-$233,450	$736,002	-$2,073,649	-$5,369,360	-$3,469,725
24	$736,002	-$233,450	$736,002	-$1,337,647	-$5,602,811	-$2,733,723
25	$736,002	-$233,450	$736,002	-$601,645	-$5,836,261	-$1,997,721
26	$736,002	-$233,450	$736,002	$134,357	-$6,069,712	-$1,261,719
27	$736,002	-$233,450	$736,002	$870,360	-$6,303,162	-$525,716
28	$736,002	-$233,450	$736,002	$1,606,362	-$6,536,613	$210,286
29	$736,002	-$233,450	$736,002	$2,342,364	-$6,770,063	$946,288
30	$736,002	-$233,450	$736,002	$3,078,366	-$7,003,514	$1,682,290

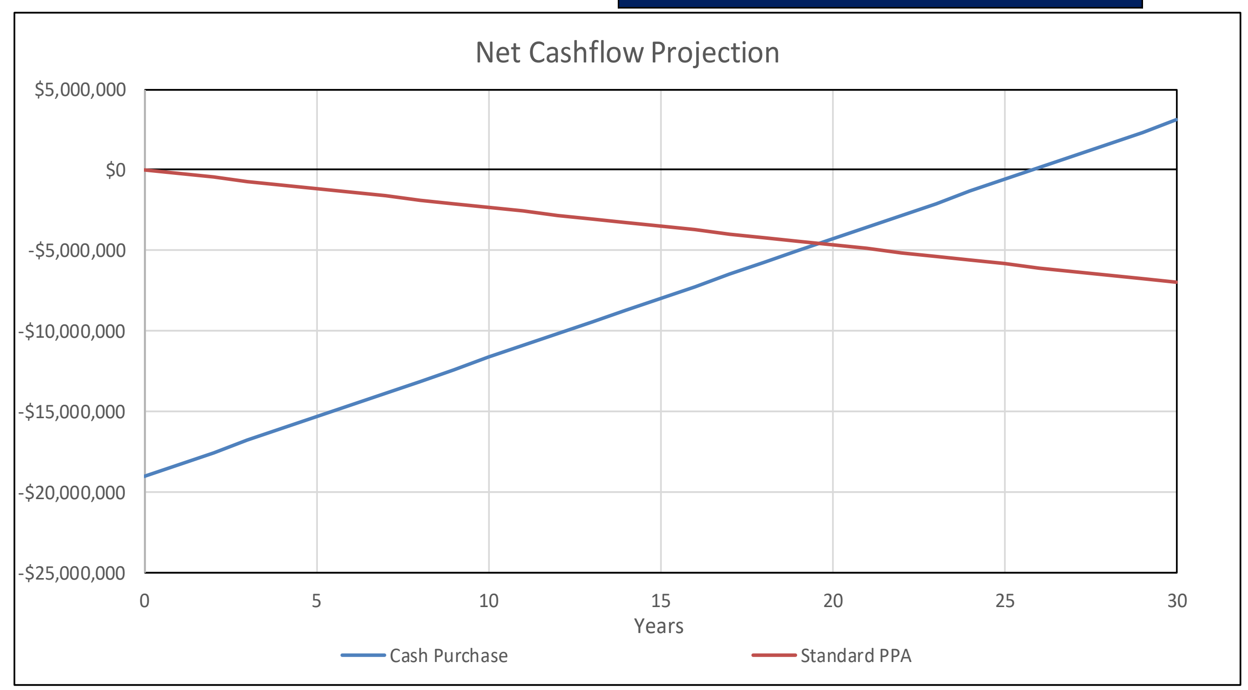
Cash Purchase	
Gross Project Cost	$42,226,000
Rebates	-$12,667,800
85% Depreciation	-$10,556,500
n/a	$0
Final Cost	$19,001,700
Utility Savings	$736,002
Payback	25.8
Financial Life (yr)	30
ROI (Over EUL)	116%

Battery Cost: $0
Solar Cost: $42,226,000

Standard PPA	
Gross Project Cost	$42,226,000
Rebates	-$12,667,800
85% Depreciation	-$10,556,500
n/a	$0
Final Cost	$19,001,700
Financial Life (yr)	30
Interest Rate	3.0%
Annual Income from Loan	$969,453
Utility Savings	$736,002
Annual Savings	-$233,450

Battery Cost: $0
Solar Cost: $42,226,000

PPA with Year 10 Buyout	
Gross Project Cost	$42,226,000
Rebates	-$12,667,800
85% Depreciation	-$10,556,500
n/a	$0
Final Cost	$19,001,700
Financial Life (yr)	30
Interest Rate	3.0%
Years 1-10	
Contractor's Income	$969,453
Utility Savings	$736,002
Customer Savings	-$233,450
Years 11-30	
Contractor O&P	15%
Buyout Cost	$10,703,249
Utility Savings	$736,002
Year 11-25 Payback	14.5
Lifetime Savings	$12,385,540
ROI (Over RUL)	116%



ETB Outputs

					Raw Utility Info				8.2% Cost Markup			
Bill Date Ranges			Energy Before PV/ESS (kWh)	Max Demand Before PV/ESS	Charges Before PV/ESS ($)				Charges Before PV/ESS ($)			
Start Date	End Date	Season	Total	NC / Max	Other	Energy	Demand	Total	Other	Energy	Demand	Total
1/1/2023	2/1/2023	W	679711	1736	193.22	65296.44	30883.44	96373.1	$ 209.06	$ 70,650.75	$ 33,415.88	$ 104,275.69
2/1/2023	3/1/2023	W	600919	1736	193.22	57727.28	30883.44	88803.94	$ 209.06	$ 62,460.92	$ 33,415.88	$ 96,085.86
3/1/2023	4/1/2023	W	664643	1736	193.22	63848.93	30883.44	94925.59	$ 209.06	$ 69,084.54	$ 33,415.88	$ 102,709.49
4/1/2023	5/1/2023	W	661687	1736	193.22	63564.96	30883.44	94641.62	$ 209.06	$ 68,777.29	$ 33,415.88	$ 102,402.23
5/1/2023	6/1/2023	W	695186	1736	193.22	66783.04	30883.44	97859.7	$ 209.06	$ 72,259.25	$ 33,415.88	$ 105,884.20
6/1/2022	7/1/2022	S	889101	1860	193.22	88248.61	33089.4	121531.2	$ 209.06	$ 95,485.00	$ 35,802.73	$ 131,496.79
7/1/2022	8/1/2022	S	1099027	2045	193.22	109085	36380.55	145658.8	$ 209.06	$ 118,029.99	$ 39,363.76	$ 157,602.81
8/1/2022	9/1/2022	S	1103331	2170	193.22	109512.2	38604.3	148309.7	$ 209.06	$ 118,492.22	$ 41,769.85	$ 160,471.14
9/1/2022	10/1/2022	S	831214	1775	193.22	82502.98	31577.25	114273.5	$ 209.06	$ 89,268.22	$ 34,166.58	$ 123,643.87
10/1/2022	11/1/2022	W	756430	1761	193.22	72666.45	31328.19	104187.9	$ 209.06	$ 78,625.10	$ 33,897.10	$ 112,731.26
11/1/2022	12/1/2022	W	706409	1736	193.22	67861.18	30883.44	98937.84	$ 209.06	$ 73,425.80	$ 33,415.88	$ 107,050.74
12/1/2022	1/1/2023	W	685396	1736	193.22	65842.57	30883.44	96919.23	$ 209.06	$ 71,241.66	$ 33,415.88	$ 104,866.61
Subtotal			9373054		2318.64	912939.7	387163.8	0	$ 2,508.77	$ 987,800.73	$ 418,911.20	$ -
Adjustmen			0		0	0	0	0	$ -	$ -	$ -	$ -
Total			9373054		2318.64	912939.7	387163.8	1302422	$ 2,508.77	$ 987,800.73	$ 418,911.20	$1,409,220.70

Bill Date Ranges			Energy After PV & Before ESS	Max Demand After PV & Before	Charges After PV & Before ESS ($)				Charges After PV & Before ESS ($)			
Start Date	End Date	Season	Total	NC / Max	Other	Energy	Demand	Total	Other	Energy	Demand	Total
1/1/2023	2/1/2023	W	181806	1736	193.22	17465.19	30883.44	48541.85	$ 209.06	$ 18,897.34	$ 33,415.88	$ 52,522.28
2/1/2023	3/1/2023	W	-65872	1736	193.22	-6327.99	30883.44	24748.67	$ 209.06	$ (6,846.89)	$ 33,415.88	$ 26,778.06
3/1/2023	4/1/2023	W	-231449	1590	193.22	-22234.15	28286.1	6245.17	$ 209.06	$ (24,057.35)	$ 30,605.56	$ 6,757.27
4/1/2023	5/1/2023	W	-271895	1276	193.22	-26119.59	25873.78	-52.6	$ 209.06	$ (28,261.40)	$ 27,995.43	$ (56.91)
5/1/2023	6/1/2023	W	-236180	1288	193.22	-22688.63	25873.78	3378.36	$ 209.06	$ (24,549.10)	$ 27,995.43	$ 3,655.39
6/1/2022	7/1/2022	S	-14132	1446	193.22	-1402.69	25873.78	24664.31	$ 209.06	$ (1,517.71)	$ 27,995.43	$ 26,686.78
7/1/2022	8/1/2022	S	139076	1710	193.22	13804.13	30420.9	44418.25	$ 209.06	$ 14,936.07	$ 32,915.41	$ 48,060.55
8/1/2022	9/1/2022	S	118395	1818	193.22	11751.41	32342.22	44286.85	$ 209.06	$ 12,715.03	$ 34,994.28	$ 47,918.37
9/1/2022	10/1/2022	S	-24413	1570	193.22	-2423.14	27930.3	25700.38	$ 209.06	$ (2,621.84)	$ 30,220.58	$ 27,807.81
10/1/2022	11/1/2022	W	-502	1568	193.22	-48.22	27894.72	28039.72	$ 209.06	$ (52.17)	$ 30,182.09	$ 30,338.98
11/1/2022	12/1/2022	W	154392	1736	193.22	14831.67	30883.44	45908.33	$ 209.06	$ 16,047.87	$ 33,415.88	$ 49,672.81
12/1/2022	1/1/2023	W	236741	1736	193.22	22742.52	30883.44	53819.18	$ 209.06	$ 24,607.41	$ 33,415.88	$ 58,232.35
Subtotal			-14033		2318.64	-649.49	348029.3	0	$ 2,508.77	$ (702.75)	$ 376,567.74	$ -
Adjustmen			0		0	0	0	0	$ -	$ -	$ -	$ -
Total			-14033		2318.64	76720.88	348029.3	427068.9	$ 2,508.77	$ 83,011.99	$ 376,567.74	$ 462,088.50

Bill Date Ranges			Energy After PV & Before ESS	Max Demand After PV & Before	Charges After PV & Before ESS ($)				Charges After PV/ESS ($)			
Start Date	End Date	Season	Total	NC / Max	Other	Energy	Demand	Total	Other	Energy	Demand	Total
1/1/2023	2/1/2023	W	181806	1736	193.22	17465.19	30883.44	48541.85	$ 209.06	$ 18,897.34	$ 33,415.88	$ 52,522.28
2/1/2023	3/1/2023	W	-65872	1736	193.22	-6327.99	30883.44	24748.67	$ 209.06	$ (6,846.89)	$ 33,415.88	$ 26,778.06
3/1/2023	4/1/2023	W	-231449	1590	193.22	-22234.15	28286.1	6245.17	$ 209.06	$ (24,057.35)	$ 30,605.56	$ 6,757.27
4/1/2023	5/1/2023	W	-271895	1276	193.22	-26119.59	25873.78	-52.6	$ 209.06	$ (28,261.40)	$ 27,995.43	$ (56.91)
5/1/2023	6/1/2023	W	-236180	1288	193.22	-22688.63	25873.78	3378.36	$ 209.06	$ (24,549.10)	$ 27,995.43	$ 3,655.39
6/1/2022	7/1/2022	S	-14132	1446	193.22	-1402.69	25873.78	24664.31	$ 209.06	$ (1,517.71)	$ 27,995.43	$ 26,686.78
7/1/2022	8/1/2022	S	139076	1710	193.22	13804.13	30420.9	44418.25	$ 209.06	$ 14,936.07	$ 32,915.41	$ 48,060.55
8/1/2022	9/1/2022	S	118395	1818	193.22	11751.41	32342.22	44286.85	$ 209.06	$ 12,715.03	$ 34,994.28	$ 47,918.37
9/1/2022	10/1/2022	S	-24413	1570	193.22	-2423.14	27930.3	25700.38	$ 209.06	$ (2,621.84)	$ 30,220.58	$ 27,807.81
10/1/2022	11/1/2022	W	-502	1568	193.22	-48.22	27894.72	28039.72	$ 209.06	$ (52.17)	$ 30,182.09	$ 30,338.98
11/1/2022	12/1/2022	W	154392	1736	193.22	14831.67	30883.44	45908.33	$ 209.06	$ 16,047.87	$ 33,415.88	$ 49,672.81
12/1/2022	1/1/2023	W	236741	1736	193.22	22742.52	30883.44	53819.18	$ 209.06	$ 24,607.41	$ 33,415.88	$ 58,232.35
Subtotal			-14033		2318.64	-649.49	348029.3	0	$ 2,508.77	$ (702.75)	$ 376,567.74	$ -
Adjustmen			0		0	0	0	0	$ -	$ -	$ -	$ -
Total			-14033		2318.64	76720.88	348029.3	427068.9	$ 2,508.77	$ 83,011.99	$ 376,567.74	$ 462,088.50

Energy ToolBase

PV SYSTEM DETAILS

GENERAL INFORMATION
Facility: Ancora Psychiatric Hospital
Address: 301 Spring Garden Rd, Hammonton, NJ 08037

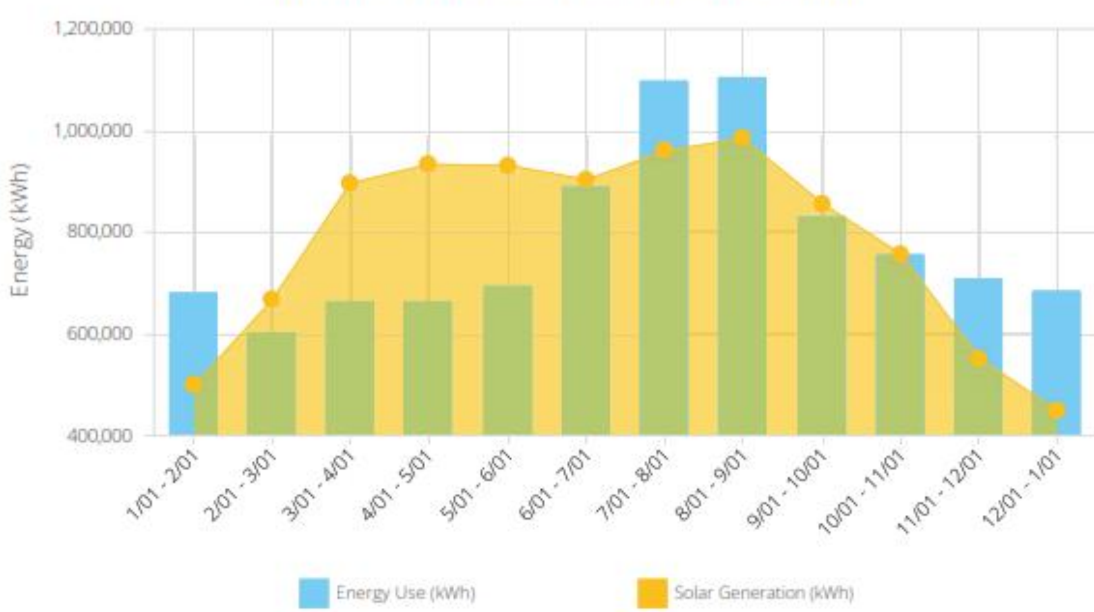
SOLAR PV SYSTEM RATING
Power Rating: 6,952,000 W-DC
Power Rating: 6,118,038 W-AC-CEC

SOLAR PV EQUIPMENT DESCRIPTION
Solar Panels: (21725) Trina Solar TSM-PD14 320 (May16)
Inverters: (186) SMA Sunny Tripower X 30-US

ENERGY CONSUMPTION MIX
Annual Energy Use: 9,373,054 kWh

SOLAR PV EQUIPMENT TYPICAL LIFESPAN
Solar Panels: Greater than 30 Years
Inverters: 15 Years

MONTHLY ENERGY USE VS SOLAR GENERATION



ENVIRONMENTAL BENEFITS

OVER THE NEXT 20 YEARS, YOUR SYSTEM WILL DO MORE THAN JUST SAVE YOU MONEY. ACCORDING TO THE EPA'S GREENHOUSE GAS EQUIVALENCIES CALCULATOR (SOURCE), YOUR SOLAR PV SYSTEM WILL HAVE THE IMPACT OF REDUCING:

147,064

tons of CO2 Offset

334,383,684

Miles Driven By Cars

2,205,965

Trees Planted

APPENDIX D: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate fiscal savings associated with measures. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is $22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
Btu	*British thermal unit*: a unit of energy equal to the amount of heat required to increase the temperature of one pound of water by one-degree Fahrenheit.
CHP	*Combined heat and power*. Also referred to as cogeneration.
COP	*Coefficient of performance*: a measure of efficiency in terms of useful energy delivered divided by total energy input.
Demand Response	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
DCV	*Demand control ventilation*: a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	*United States Department of Energy*
EC Motor	*Electronically commutated motor*
ECM	*Energy conservation measure*
EER	*Energy efficiency ratio*: a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	*Energy Use Intensity:* measures energy consumption per square foot and is a standard metric for comparing buildings' energy performance.
Energy Efficiency	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing the operation of energy use systems. Unlike conservation, which involves some reduction of service, energy efficiency provides energy reductions without sacrifice of service.
ENERGY STAR	ENERGY STAR is the government-backed symbol for energy efficiency. The ENERGY STAR program is managed by the EPA.
EPA	*United States Environmental Protection Agency*
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	*Greenhouse gas* gases that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.
gpf	*Gallons per flush*

gpm	*Gallon per minute*
HID	*High intensity discharge:* high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
hp	*Horsepower*
HPS	*High-pressure sodium*: a type of HID lamp.
HSPF	*Heating seasonal performance factor:* a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
HVAC	*Heating, ventilating, and air conditioning*
IHP 2014	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
IPLV	*Integrated part load value:* a measure of the part load efficiency usually applied to chillers.
kBtu	One thousand British thermal units
kW	*Kilowatt*: equal to 1,000 Watts.
kWh	*Kilowatt-hour*: 1,000 Watts of power expended over one hour.
LED	*Light emitting diode*: a high-efficiency source of light with a long lamp life.
LGEA	*Local Government Energy Audit*
Load	The total power a building or system is using at any given time.
Measure	A single activity, or installation of a single type of equipment, which is implemented in a building system to reduce total energy consumption.
MH	*Metal halide*: a type of HID lamp.
MBh	*Thousand Btu per hour*
MBtu	*One thousand British thermal units*
MMBtu	*One million British thermal units*
MV	*Mercury Vapor:* a type of HID lamp.
NJBPU	*New Jersey Board of Public Utilities*
NJCEP	*New Jersey's Clean Energy Program:* NJCEP is a statewide program that offers financial incentives, programs and services for New Jersey residents, business owners and local governments to help them save energy, money, and the environment.
psig	Pounds per square inch gauge
Plug Load	Refers to the amount of power used in a space by products that are powered by means of an ordinary AC plug.
PV	*Photovoltaic:* refers to an electronic device capable of converting incident light directly into electricity (direct current).

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR Portfolio Manager.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC (II)	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of 1/8th of an inch.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
therm	100,000 Btu. Typically used as a measure of natural gas consumption.
tons	A unit of cooling capacity equal to 12,000 Btu/hr.
Turnkey	Provision of a complete product or service that is ready for immediate use.
VAV	*Variable air volume*
VFD	*Variable frequency drive*: a controller used to vary the speed of an electric motor.
WaterSense	The symbol for water efficiency. The WaterSense program is managed by the EPA.
Watt (W)	Unit of power commonly used to measure electricity use.